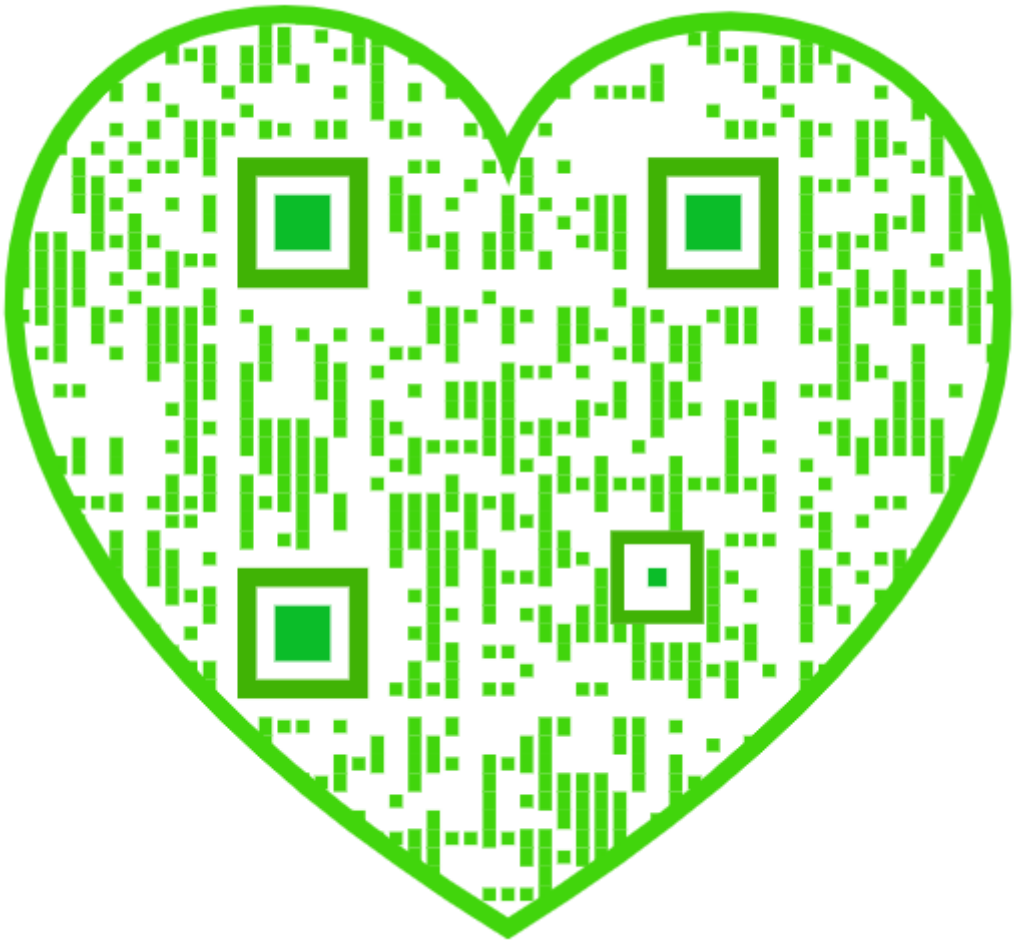
THESIS

RASPBERRY, CURRANT
AND STRAWBERRY.

RAYMOND HARVEY WILKINS

1915



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THESIS

PRESENTED TO THE

DEPARTMENT OF POMOLOGY

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MASTER OF SCIENCE OF AGRICULTURE

BY

RAYMOND HARVEY WILKINS.

1915.

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RASPBERRY

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The Raspberry.

The raspberry is one of our oldest fruits, and with few but unimportant exceptions comes from three main and distinct sources; Rubus Ideaus, which is the common wild red raspberry of Europe; Rubus strigosus, the common wild red raspberry of America and Rubus occidentalis, the wild black cap of this country. There are also a number of other species, which are spread all over the United States, but they have not developed any varieties of importance, and are of no importance to the commercial grower. Grays classification follows ;

Raspberry.

Natural Family Rosaceae.

General characters.

Perennial herbs, or somewhat shrubby plants, with biennial and, in a few species, perennial woody stems; Flowers white or red, petals five deciduous; stamens many; seeds collected on a spongy, succulent receptacle, becoming small drupes, which readily parts from the dry receptacle when ripe.

Species.

Rubus Ideaus,- European Raspberry.--Stems erect woody, prickles, slender, straight; leaves trifoliate; leaves ovate, deeply serrate; whitish tomentose beneath, green above, flowers white; fruit red or yellowish-white; root perennial, creeping producing numerous suckers. Common garden raspberry. Native of various portions of

Europe and probably of Asia.

Rubus strigosus,- Wild red raspberry, stems upright, beset with stiff, straight bristles; leaflets three to five, oblong, pointed, ovate, cut serate, whitish downy underneath; fruit light red, finely flavored. Common everywhere and many varieties in cultivation.

Rubus occidentalis. Black raspberry.- stems recurved, armed with hooked prickles; leaflets three, sometimes five, ovate, pointed, coarsely serate, whitened underneath, fruit purple or black; occasionally a yellowish-white. A variable species.

The European raspberry is very old - and runs far back into ancient history. Cato whose time was 234 B.C., mentions it as a natural product of Roman territory. Pliny, a Greek, who is supposed to have written somewhere between 30 and 50 A.D., mentions it, and apparently it was cultivated by the Greeks of his time. They traced it to Mt.Ida where it is claimed to have grown wild, and from here it received its name. Card says; "Although deriving its name from this locality from which it was particularly abundant, the raspberry is indigenous over the greater part of Europe and northern Asia." "Paladus however a Roman writer of the fourth century, mentions the raspberry as one of the cultivated fruits of that time. From a work written by Conrad Heresbach, entitled "Rei Rusticae", published in 1570 and afterward translated by Barnaby Googe, it appears that raspberries were little attended to during that period. John Parkinson in his

"Pardisus", published in 1629, speaks of red, white and thornless raspberries as suitable for English climate. Stephen Sqaizer in 1724 only mentions three kinds. George W. Johnson, in his "History of English Gardening", published in 1829, gives the number of cultivates varieties as twenty-three. From these detached notes it appears that although cultivated as far back as the fourth century, it never the less did not come to be considered a fruit until the close of the sixteenth century, or later."

Indefinite as the early history appears to be, it can be seen, that from southern Europe, it worked its way into the gardens of France and England and thence into the U. S. To this species belongs the Antwerp, one of the first varieties imported to this country. Of this variety Michigan Bull. No. III speaks as follows; "This old variety which has been in cultivation for upwards of a century or perhaps longer, derives its name from Antwerp city, in Belgium, tho the variety itself is said to have come from the Island of Malta. Ever since its introduction, it has been the best variety in cultivation, both in England and in the United States, and the standard of excellence as to quality. From it, have been derived many, if not most, of the species found in our gardens. Its name has been so long and prominently before the public that it has not only acculiminated a formidable array of synonyms but, what is more troublesome, many other varieties are called by its name. In fact for a long time in the early history of this fruit in the U.S. (up till about 1850) al-

most any red raspberry was liable to be called an Antwerp, even as now in many markets all cultivated blackberries are called "Lawtons". This was not withstanding the fact that tho the Antwerp was upon the tongue and in the press it was never in this country grown for market, except for possibly a short time, around New York and Boston. "The Fraconia is another variety of this species, but like the Antwerp, it only grows in a small section of this country.

The foreign varieties tho bearers of abundant and excellent fruit, have in allcases proven themselves to be adapted to only certain small sections of the United States, primarily that region around the Hudson River Valley. This is due to their lack of hardiness and their inability to withstand the hot summer sun of our country. As a result of the Ideaus not thriving in this country, attention was eventually directed to the cultivation of our native species.

The black cap or Rubus occidentalis seems to have been the first species to receive cultivation and the early settlers often transplanted it to their gardens. This species is indigeuous to nearly all of the United States, extending as far west as the Rocky Mts., south to Texas and Alabama and north as far as southern Canada, attaining its greatest abundance in Ohio and Indiana. A. A. Crozier describes the development of the black cap, and shows the difficulties under which it received development. "This species was for a long time cultivated in a

small way with no attempt at improvement, and apparently without any superior natural varieties being recognized. In fact for a time prior to 1850 the ordinary wild form had come to be cultivated quite largely for market by some of the gardeners near New York City. The first distinct variety of this species of which we have record, is the Ohio Everbearing, which attracted attention as early as 1832 from its habit of fruiting to a greater or less extent upon the young canes in the autumn. For a family garden this was considered to be a desirable feature, tho no varieties of this class ever found favor for market purposes. The yellow form of the black cap represented by the Golden Cap and other varieties were introduced at about the same time. The Doolittle next came into notice about 1850 and obtained prominence not so much on account of its superiority to the wild species as to the persistent advocacy of its merits on the part of the introducer, who claimed to have improved it and to have substained it in vigor, solely by means of propogation by means of young plants. It was a good variety however, hardly and productive and is still in cultivation. The sharp discussion which took place at the introduction of this variety, may be said to have decided the fate of the black raspberry as a cultivated fruit. Its merits were not so popularly and universally endorsed however, as might be supposed from the position the fruit has since attained in our markets. In 1862 the editor of the American Agriculturist wrote."All of the finer varieties are of foreign origin or seedlings of such sorts. After years of trial we have

abandoned both the red and black." A few years after this Charles Downing said that he did not dare to consider the black cap species worthy of cultivation. In 1870 Dr. J. A. Warder said of the black caps "More discriminating taste consider these essentially market fruits, and unfit for the table of the refined pomologist". "The esteem in which this species is now held varies considerably with different persons and in different localities. Black caps generally bring a lower price in the market than the reds.,- not only because they are more easily grown and more abundantly offered, but also because of their less attractive color and to many persons inferior flavor."

The Rubus strogosus or red cap, tho receiving cultivation at a later date than the black, was caused no doubt by the attempt of growers to acclimate the Ideaus to this country. This species of the native raspberry, which is the most popular, has a much wider range than the black. Its greatest natural development occurs, along the boundary of the United States and Canada, thus extending much farther North than the occidentalis. However, it is not so easily cultivated and the varieties belonging to it are often obscure. Many of the varieties are assigned to the strogosus, by botanist, mainly from structural characteristics alone. This is caused by the fact that nearly all of our varieties are simply chance or artificial seedlings upon cultivated ground. Thus the Turner which is the hardiest red, has always been considered a strictly native variety. Prof. Turner its originator says it came from other seedlings, which

themselves had grown from seed of the Red Antwerp. The Cuthbert originated near New York City, from a variety known as Hudson River Antwerp, which is known to have English origin. Mich. Bull. No. III in discussing the native red, concludes "It seems possible therefore that American seedlings of European sorts, and hybridization from the same foreign source, may have played a more important part in the development of our cultivated red raspberries than has been generally supposed, and that the characteristic features of the foreign species, lack of hardiness, small light colored canes, numerous prickles, and thick rogose leaves, may become so far modified by cultivation and crossing that one cannot always be certain from inspection alone to which species, in whole or in part, a variety belongs."

Among the first varieties of our native red that attracted importance was the Stoever, this variety was found wild in Vermont by J. F. Stoever and it first fruited under cultivation in 1859. It was first mentioned by the "Michigan Farmer in 1860. The Brandywine which was first found in the wild state near Wilmington, Delaware, along the Brandywine River was another important variety. It first attracted attention about 1870, and was admitted to the "American Pomological Society" in 1877. Today there are many varieties of the strigosus, but nearly all are of an indefinable origin. With the increasing demand for this fruit and the variableness of the species, there is a great opportunity for its development, and some time in the future the native red will no doubt produce fruit equal in quality

to that of the Rubus Ideaus.

The Origin of the Rubus Neglectus is not definitely known and two theories are advanced. The old botanist Peck describes the fruit as a distinct species. Later day botanist consider it to be of a hybrid origin, due to the fact that it is of an intermediate character between the red and black species; its location is usually in the vicinity of the varieties mentioned and seldom occurs in large amounts in a native state, when alone.

The group is known as the purple cane which was the name of the first cultivated variety. This was first grown near Phil. and New York, nearly a hundred years ago, and for half a century it was the leading variety in this country. The Shaffer was an isolated seedling, discovered near Scotsville, N.Y., and was introduced in 1878. Owing to its productiveness and large size, it is today the most popular of the purple cane variety.

The methods of propogation vary with the different species, and the methods used are by, seeds, root cuttings and tip layers.

It is true that all cultivated varieties will propogate from the seed, but like the apple, they are not true and offspring are not like the mother plant. Only occasionally does a seedling appear, that can be compared to the cultivated varieties. As a result this method of propogation is not practiced.

The Red Cap.

Red raspberries are propogated by means of suckers

and root cuttings. These two methods are practically the same in as much as suckers eminate from the roots near the surface, either naturally or by mechanical injury to the roots. Sucker growth is often induced by deep cultivation, by practicing a too light and shallow cultivation when the plants were young.

In the case of the red cap the grower is less concerned with the production of new plants, than in the destruction of these same plants. Nearly all varieties sucker too freely and this growth much be retarded. Hence the method of propogation by means of suckers is the most common. When the plants are to be used in setting a new bed, care should be exercised in removing them from the earth. They should be dug up with a spade by thrusting beneath theroots and loosening the soil above, leaving from three to five inches of the root adhering to the plant, and then immediately setting in place where they are to stand permanently. If the plant is pulled up directly without loosening the roots and earth, the shoot is likely to break from the main root. This leaves only a few fibrous foot hairs from which to develop the young plant, and as a result growth is greatly retarded.

There are afew varieties which send up but a small amount of sucker growth, and in this case root cuttings are used to start new sets. In the fall vigorous plants are selected, and roots from the same, about the size of a lead pencil, and about four or five inches in length are made up. These cuttings are bedded in sand over winter, and by spring the cut ends are callused over. They are

then placed in a shallow furrow and covered with two or three inches of dirt. In planting "Budd and Hansen" recommends setting the cuttings obliquely against the side of the furrow, and deep enough so that the top will show after covering. They claim that experience has taught them, that a more even stand may be expected when this method is followed, than when planted horizontally in the bottom of the furrow and then covered with dirt.

Location of Exposure.

In the wild state the raspberry produces the finest fruit when found growing in a cool, shady spot, and free from the scorching sun. Commercially the fruit does best on a northern or western slope, which is protected from the direct rays of the sun as much as possible. For the home garden where the choice of a location is often impossible, a cool spot in the shadow of a tree or building is to be preferred.

Soils.

The red raspberry can grow and succeed on most any kind of a soil, but it must be cool and retentive of moisture, and at the same time well drained. In 1910, New York State Agr. College made a survey of western New York, regarding the different kinds of soils and the yields of each. The table below shows the following results :

1910	No. of Acres	No. of farms	Yield per Acre	Income per Acre.
Gravelly Loams	63.5	40	1,414	$141.43
Sandy Loam	30.6	21	1,306	147.29
Clay Loam	7.4	7	2,097	237.40

The general impression has been that the red cap does best on gravelly and sandy soils, but here it is found that the clay loam soils produced a 54% larger crop than did the lighter soils, and the income was about 64% greater than crops from the lighter soils. "Card" summarized soil characteristics for the red raspberry as follows:

"An upland sandy or clay loam is likely to give the best results. The land should be of moderate fertility, rich enough to produce liberal crops of fruit without being so strong as to cause an over vigorous growth of canes. This over richness is liable to be the difficulty with bottom lands, or any other low or moist location. Such rapid growth not only tends in itself to decrease productiveness, but the wood is usually not sufficiently dense and well ripened to stand the winter. A stiff hard clay is equally unfavorable, and any soil which is wet and soggy during any considerable portion of the year is sure to result in at least partial failure. The raspberry is one of the first of all fruits to suffer from excessive moisture in the soil. On the other hand it quickly suffers from drought at ripening; hence, the demand is for a soil which, while never surferted with moisture, is at the same time sufficiently retentive to be able to supply it in sufficient quantities thru out the season."

Preparation of the Soil.

The raspberry is a fruit that bears for a number of years after planting, and as a result the preparation of the land should be thorough. If possible sod land should

be avoided as it is harder for the plant to become firmly rooted there is more trouble with weeds; more difficulty in planting and more danger of drought than in a thoroughly worked and friable soil.

In planting it is well to have land that has been thoroughly worked one or two seasons previous, with a hoed or cultivated crop. Ere setting out the plantation the land should be plowed and harrowed, the essential points gained being moisture retention; friability, and a thoroughly pulverized soil. This insures a good feeding ground and an extensive root system.

Planting a plantation may occur in either the fall or the spring, depending upon conditions that best suits the grower. If the suckers are to be transplanted from the planters' own patch or from a nearby locality, early September is the best time. This will give the plants sufficient time to start growth and establish themselves in the soil, before winter sets in. However, if the planting cannot be done in the early fall, it should be delayed till spring, and then be done as early as possible so as to not retard the growth. Of late years some growers are planting during the month of May, using sprouts that have come up the same spring. Growers who have tried this method claim it to be successful in all cases.

The distance at which red raspberries are planted varies considerably and the variety grown regulates it to a great extent. Thus the Marlborough which is not a strong grower need not be planted as far apart as the

Cuthbert, which grows a great many canes and suckers each year. A general rule for the Marlboro, and such growing varieties, is to plant the rows six feet apart and the plants three feet in the row. For the rank growers such as the Cuthbert, rows six feet apart and the plants five to seven feet apart in the row is recommended. Each grower has his own idea which he thinks best, and as a result, there is a great variation in the methods followed. The above distances will give good results and a slight variation on either side of these figures will give good results. The hill system is also employed by some and this has the advantage of cultivation being practiced both ways. Here the plants are usually set five feet apart each way.

In marking theground for planting, straight furrows should be run across the fields at the distances desired, to represent the rows. Now cross furrow at the distance your plants are to be set in the row. The furrow should be about three to four inches deep and the calf tongue plow is a good implement to use for this purpose.

The following directions as given by the "International Library of Technology" may well be followed in planting : "The small raspberry plants should be kept heeled in near at hand, and when preparations for planting are complete, a small bundle of the plants should be taken out of the ground at a time, and the roots kept moist with a wet burlap sack. Often some pruning of the plant is necessary before it is put in the ground, any long straggly

roots should be trimmed back, and any broken roots that have ragged ends should be trimmed to a smooth surface so that the cut will heal well. The canes should be cut back to a small bud 12 to 15 inches from the crown. Most of the new growth should come from new buds at the crown of the root, and it is usual to cut out the old cane entirely the following spring after planting."

"Two men should work together in planting red raspberries; one man should have a spade to open up the holes for the plants, and the other should carry the plants, see to it that their roots are kept moist, prune them and set them in the holes. When the rows are marked out by a shallow furrow, the centers can work rapidly. The one with the spade should sink that implement in the ground about four inches below the bottom of the furrow and press it to one side to make an opening for the plant; the other should set the plant in the hole in the center of the furrow and both men should simultaneously push the soil against the cane from opposite sides and firm it. Then a little loose soil should be kicked over the firmed soil to form a mulch. Sometimes it is difficult to get a perfect alinement of the plants in the row and the use of a line to set the plants against may facilitate matters. The getting of red raspberry plantsninto perfect alinement is not however very important for after the first year, the canes spread out ina row one or more feet in width, and minor irregularities are not as noticeable as they would be with many other plants."

Tillage.

The plantation should receive thoroughl cultivation each year, and the characters should be such as to preserve the moisture, eliminate the weeds, thin out the surplus sucker growth and set free a certain amount of plant foods. In doing this there are two principles involved, plowing and cultivating, and of these C. S. Wilson gives the following directions :-

"Plowing - Plowing in spring or autumn is practiced to some extent in western New York in the case of the red raspberry, the main reason being to limit the width of the row. If the suckers that spring up from the root are not checked, the row will become so wide and the cane so thick that the quality and quantity of the berries is decreased. A good practice is to limit the width of the row to eight or twelve inches. Another reason for plowing is to prevent heaving. The best practice is to throw a light furrow up to the canes in the autumn and then plow it away in the spring, or else work it away with a shovel cultivator. The plow is of little value in the red raspberry patch as an aid to tillage, except for thepurposes mentioned above and when a cover crop must be turned under. Growers get good results with the use of a cultivator alone."

"Cultivating - The work of cultivating is begun as early in the spring as possible and repeated about every two weeks until picking begins, except during blossoming time or when the fruit is setting. Generally the patch

is given one good cultivation after picking in order to keep down weeds. Some growers cultivate after each picking if the season is dry, although it is not the common practice. A moderate growth of weeds is allowed in August or September as a catch or robber crop. Although it is the exception to plant a cover crop, a few growers are doing this with good results, the crops used being oats and clover. This practice is worthy of further trial."

The majority of growers, however, do not advocate the plowing of the patch as a means of cultivation, claiming that the machanical injury done the roots induces the growth of too many suckers. "Card" suggests using a cultivator with square teeth on the end, instead of pointed ones as a means of keeping down the sucker growth, between the rows.

He also emphasizes the frequent cultivation up until time of fruiting, claiming that it often adds 50 per cent to the quality and quantity of the fruit.

Fertilization.

The fertilization of the raspberry is a problem that must be worked out by each individual grower. The soils growing raspberries that have received manure and commercial fertilizers and proper cultivation in producing other crops, are not greatly benefited by applying additional plant food. On the other hand both soils that are of an inferior quality and are lacking particularly

in nitrogen, need the addition of this element to produce sufficient wood growth. All fruits are rich in potash and this element should be in excess of potassium. In the wild state the raspberry is found around decayed wood and stumps of trees, and so a liberal amount of humus is of benefit. This helps to improve both the physical condition of the soil and the moisture content.

"Card" suggests the following for a patch of unproductive land :

Muriate of Potash ---------- 50 pounds.

Ground Bone ----------250 "

This fertilizer to be applied in connection with manure and harrowed in ere planting.

The New York State College of Agriculture, made a survey in 1910 of western New York as regards the application of fertilizer and the methods adapted in the treatment of the same. The common practice is to treat the soil before planting with manure and commercial fertilizer if used. After the patch comes into bearing, but few growers apply plant food in any form.

"The following table shows the practice in this respect and gives the yields and incomes per acre under the different treatments"

Method	No.of farms	No.of Acres	Yield per acre	Income per acre
No manure or commercial fertilizer	39	81	1,168	$116.69
Manure and commercial fertilizer	13	14	1,226.7	176.69
Commercial fertilizer only	10	30	1,439	142.85
Manure	21	23	1,472	170.450

"The table indicates clearly that fertilizers are beneficial. The best results are obtained when stable manure is applied, either alone or in connection with commercial fertilizer. Commercial fertilizer alone is beneficial, but does not seem to give so good results as does stable manure alone"

Pruning.

In Cornell Reading Course Number 36, by C.S.Wilson the fruiting habits and definite directions for pruning the red raspberry are given asfollows: "The Pruning of the red raspberry will be better understood if the pruner knows the habit of growth of the plant. A new cane springs up and develops during the summer; the next spring this cane throws out fruit clusters, bears fruit, and dies that year. The root is perennial and the cane is biennial. The object of the pruner, then, should be: first, remove the old wood as soon as it dies in order to give the new wood room in which to grow: second, to secure, both by heading and thinning in, canes of sufficient vigor and development to produce the most and the largest fruit"

"The following definite directions are given as an aid to the reader".

"At planting time - The top should be cut back to four or six inches from the ground. If sprouts are transplanted in May or early autumn, they need not be cut back till the following spring.

Bearing patch * The general practice in the case of the red raspberries, first, to take out the old wood as

soon as possible after picking, and second, to head back the new shoots to three or four feet in the spring. In addition many growers formerly practiced what is known as summer pruning, or the pinching back of the new canes when they have reached a height of two or three feet. This was done in order to make them branch as it was believed that a branched cane carried more fruit buds than a straight cane. At the present time, however, this practice is not looked upon with favor. It is necessary in the case of the black raspberry and the black berry, but with the red raspberry the operation seems to force up too many suckers from the roots. The side branches that develop are also often weak and immature.

Summer pruning is now the exception rather than the rule although the few men who practice it are successful growers. They do the work in early June and as a result, secure a low branching bush. The red raspberry patch seldom becomes unmanageable because of too vigorous cane growth, and this is probably the reason why summer pruning is not found necessary.

It is occasionally recommended to leave the old canes till spring. There seems to be no advantage in doing this. The snow is not heavy enough to break the new canes, nor are the winters severe enough in New York to require this additional protection.

The common practice in spring pruning is to cut off the tips as early as possible, leaving the canes three or four feet high. In the case of the Marlboro this pruning

would be less severe, in as much as the plants of this variety are naturally lower and more branching than those of the Cuthbert. A few growers perform this operation in autumn after the canes have matured, but it is not the best time. They do not remove the frozen tips, which of course, is done if spring pruning is practiced."

Harvesting and Marketing.

The red raspberry in the latitude of New York State ripens from the first to the middle part of July. The strawberry season often over laps it and hence part or all of the pickers of this crop can be used in harvesting the red raspberry. It is a very juicy and tender fruit and requires very delicate handling. Girls and women as a general rule are the best pickers, as they handle the fruit in a lighter and more careful manner, than do the men.

Red raspberries if possible should be picked every other day. When ripe they deteriorate very rapidly, even when left on the bushes. Again they are a soft and difficult fruit to ship when at the best, and they should be sent to market when fresh and as solid as possible. The fruit should not be picked until it parts easily from the plant, and never when wet as it then spoilts more rapidly.

In nearly all cases the fruit is picked in pint baskets so made that they will fit snugly into regular strawberry crates. The raspberry is a hollow fruit and will not stand very much pressure, without its spoiling. This is one of the principle reasons that the pint basket is used instead of the quart.

The pickers should have a tray, holding six or eight baskets. When these are filled they are turned in and a check given as a receipt. At the end of the week or of the season the checks are turned in and payment is received, usually at the rate of one and one-half cents per pint. In picking great care should be exercised. If proper precautions are taken in filling the baskets, a second handling and the necessity of grading is eliminated in preparing the fruit for the market. This is especially true of the raspberry on account of its delicate nature. After gathering, the fruit should be kept in a cool and well ventilated place until ready to ship.

The local market is always to be preferred for the raspberry. This is caused in the main by its poor shipping qualities. With a local market, the producer can become better acquainted and more easily establish a reputation. The distant market requires a commission man, and the profits must be split. The greatest advantage of the local market however, is that the producer can take his fruit in a spring wagon, and it will arrive in a much better condition, give more satisfaction and bring more money, than fruit that is sent by express, to a more distant market.

The Black Cap.

The method of growth of the red raspberry is different than that of the red and a different method of propogation must be practiced. In the red raspberry the canes spring from the roots, which spread out several inches beneath the surface of the soil in a horizontal direction. The black cap canes eminate from a central crown, and not

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Soils.

What is true of the red raspberry as regards location and soil, may be said to apply as a general rule to the black. However the soil characteristics of the black seem to differ somewhat as shown by a survey of western New York by the New York State College of Agriculture.

Soils	Acerage	Yield per acre. Qts.	Income per acre.
Sandy Loam	77.85	1434.50	$106.59
Gravelly Loam	51.08	1405.40	107.05
Clay soils	10.25	1266.05	100.83

Practically the only difference to be noticed is that the black cap seems to prefer the lighter and warmer soils. At the same time the black raspberry seems at home on any well drained, sandy or clay loam, and conditions applying to the red seem to apply equally well to the black.

Planting.

From the method of propogation it follows that it is always best to plant in the spring. The plants do not make sufficient growth to insure transplanting later in the same season. On account of the ~~red~~ black raspberry having a more spreading habit of growth, than the red, it is well to plant a little farther apart. Seven feet between the rows and four or five feet in the rows is a good distance and should always be followed when planting the vigorous varieties. The ordinary distance of three feet in the row, with rows six feet apart, will give good results, but a little more space per plant, will often result in a larger and better crop of fruit. If the hill system is practiced,

the weaker growing varieties may be set five feet apart each way. For those varieties that produce a heavy cane growth, a distance of not less than six feet each way should not be considered.

The field is cross furrowed at the desired distance, as in the case of the red raspberry. The plants should be set in the bottom of the furrow, and not covered with more than two inches of soil. If the plants are set too deep, there is great danger of smothering the young buds, and death will often result. As the canes begin to grow the furrow is gradually filled up. When the plants are set this way they appear to withstand the drought better, and there is less trouble of them blowing over, than when planted shallow.

Tillage.

The same cultivation may be practiced for the black as for the red with the exception, that there is no sucker growth to contend with in the black cap. As a result deep cultivation should be practiced during the spring. When drought is prevalent, all that is needed is shallow cultivation to keep down the weeds, and form a dust mulch to maintain the moisture content.

Pruning.

As the growing habit of the black raspberry is somewhat different from that of the red so does the pruning differ to a slight extent. Cornell Reading Course No. 36 by C.S. Wilson gives the method of growth and the methods

to be observed in pruning the black raspberry;

"There is a slight difference between the methods of pruning the red and the black raspberry, a variation due to different habits of growth, As stated previously, the canes of the black raspberry grow long and droop to the ground, whereas the canes of the red raspberry are shorter and upright. Because of this long, growing and drooping habit of growth of the canes, growers pinch off the tips of the black raspberry in order to make the canes branch. A branched cane is more desired because it contains more fruit buds than does a straight cane.

The work is done when the canes are twenty-four to thirty inches high, which in New York is usually during late June or July. If it is done in time the tender tips may be pinched off with the fingers and the use of shears is not necessary. The patch must be gone over more than once, since the canes will not all reach the desired height at the same time. The last pruning can be done during picking time as the grower goes back and forth thru the patch. The canes then develop lateral branches, which become strong and mature by autumn. These in turn, are headed black in spring.

The heading in these lateral branches is omitted by half the growers. The practice is a good one provided it is done intelligently, and the point to be considered in the heading-in is the fruiting habit of the variety. In some varieties the fruit clusters develop near the base of the branch, whereas in others they develop near the tip.

In the former case the heading back of the branches is desirable, while in the latter is it not recommended because too much of the fruiting surface is often removed. Probably the reason why this pruning of the laterals is not more widely practiced is because the grower does not know the fruiting habits of the variety in question.

Briefly summarized the pruning of the black raspberry is as follows: The old canes should be cut out and burned soon after fruiting. The new canes should be pinched back when from twenty-four to thirty inches high, and thinned to not more than five or six ~~inches~~ canes. to ~~each~~ crown. This pruning which is calledsummer pruning, will be done during June or July. In the spring the lateral branches are cut back so that the remaining buds will develop into strong fruit clusters. The amount of this cutting back will depend on the variety, the bearing habits of which can soon be determined by observation."

Harvesting and Marketing.

The raspberry when marketed as a fresh fruit, receives practically the same treatment as that of the red. The only exception being that it is sent to market in quart boxes instead of the pint size. It is a cheaper fruit and less popular than the red, caused by the fact that it is much seedier and of an inferior flavor and quality. The fruit is more solid than the red and will hold up very well in the quart sized basket. However, if the demand for this fruit was greater, it would be best to market in the pint size basket, as it would be more attractive and would handle much better. The use of the black cap should be

more general, and with the development of newer varieties, as a fresh fruit, it will no doubt become more popular in the future.

At present the demand for this fruit is, as a dried or canned product. This is especially desirable for those growers who are so situated that they can dispose of their fruit at these factories.

When the fruit is to be marketed as a dried or canned product, a great number of pickers are not necessary. It does not need to be handled in a light a careful manner to avoid crushing. Another advantage, gained by this fact, is, that the producer located at a considerable distance from the market can compete with the nearby grower. This is made possible by the advent of the "Harvester", and by the fact that fruit can be shipped to a considerable distance, with no danger of a crushed condition affecting theprice of the product.

The harvester is a very simple affair, consisting of a canvas traytabout three feet square, there being only enough wood on it to form a frame work, and to enable it to be moved about. Thepicker holds the tray up against the bush, and by the aid of a stick, striked the bushes and jars the fruit into the tray. Instead of a stick, some people use a wire loop, covered with canvas, in knocking off the fruit, claiming there is not as much danger in crushing, when this instrument is used. In gathering by this method, the berries are allowed to become quite ripe, and the patch is only gone over three or four times during

the season. By the use of the harvester, one man can gather as much as six to ten bushels of fruit per day.

In the management of the black raspberry patch, the same cultural directions, as in the case of the red cap are followed, with the few exceptions, mentioned and discussed in the above.

Diseases of Raspberries.

There are four diseases that are more or less troublesome to the grower of raspberries - anthracnose, cane-blight, crown-gall, and red-rust. The brief descriptions of these diseases and the methods of their control which are given below are taken directly from Cornell University Agricultural Experiment Station Bulletin 283* and from Bulletin 56 of the Canadian Experimental Farm.+

Anthracnose.

This disease first makes its appearance when the young shoots are twelve to fifteen inches in length, and is recognized by the brownish or purplish patches or depressions on the young shoots and leaf-stalks. As the shoots grow the blotches become larger and grayish in the center, and by the end of the season may encircle the cane and practically girdle it. <u>This disease is very destructive to black raspberries, but not often injurious to the red varieties</u>.

Control - Eradication is the best method of control. All the old canes, and the new ones that are badly diseased, should be cut out and burned as soon as the fruit is gathered. Applications of bordeauz, 5-5-50, will control the malady but this treatment may not be profitable. If spraying seems advisable the first application should be made when the new canes are six to eight inches high. The second and third applications should be made at intervals of ten to fourteen days.°

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* The Control of Insect Pests and Plant Diseases, p.490
+ Bush-Fruits, by W. T. Macoun, p.57
° New York (Geneva) Agricultural Experiment Station Bull.224

The grower should be careful to plant new patches where the disease is not prevalent. The departments of Pomology and Plant Pathology of the New York State College of Agriculture at Cornell University are now studying cooperatively different spraying mixtures for controlling this disease.

Cane-blight, or wilt.

This disease affects both red and black varieties. It is caused by a fungus that attacks the cane at some point and kills the bark and wood. That part of the fruit cane above the diseased portion suddenly wilts and dies. No successful method of treatment is known. It will help greatly in the control of the disease if the fruit canes are cut and burned as soon as the fuit is gathered. In making new settings the grower should use only plants from healthy patches.

Crown-gall or root-knot.

This is a bacterial disease that is often destructive particularly to the red varieties. It is detected by the large, irregular knots on the roots and at the crown underground. The disease is contagious.

Control - The grower should avoid planting on infested land, and should never set plants showing the root-knots. Other than these two precautions, no effective method of treatment is known.

Red-rust.

The fungous disease known as red-rust, or yellows, is often serious on both the black and the red varieties. In

some sections of New York it has made the crop unprofitable, while in other sections it is not found at all.

Control - As soon as the disease appears in the patch the affected plants should be rooted up and burned immediately, making sure that all the roots are removed. If the disease is to be successfully checked this method of eradication must be carefully carried out.

Insects Injurious to Raspberries.

The two insects that are injurious to the raspberry are briefly described below and the methods of their control are given. These descriptiomsare taken directly from the same sources as are those of the diseases.

Sawfly.

The adult flies are black, with a dull reddish spot in the middle of the abdomen above. They are about the size of the house-fly, but are narrower in shape and have four wings. The eggs are inserted into the tissues of the leaf and a small brown patch appears on the leaf above each egg. The eggs hatch after about a week. The larvae, which are greenish in color and covered with rows of spines, feed on the tender leaves in spring. They become full*grown by July, when they fall to the ground and spin small cocoons beneath the surface of the soil.

Control - The insect is controlled by the application of weak solutions of paris green or arsenate of lead, but these poisons should not be used after the fruit is formed. Hellebore may be substituted, as this loses strength rapidly after being applied. It may be dusted

over the bushes or steeped in water and sprayed on.

Cane borer.

The adult is a slender beetle, with black wing covers and a yellow thorax. In laying her eggs the female girdles the tip of the cane with rings of punctures. These rings are separated from one another by about an inch. Between the rings the female pierces the cane and forces into it a long, light-colored egg. Immediately after this girdling, the tip of the cane droops and soon dies. The egg hatches in a few days and the young larva burrows down the center of the stem, consuming the pith. The larva passes the first winter in its burrows nor far from where the egg was deposited, and by the second fall reaches the root, where it passes the winter and changes into a pupa the next spring. The beetles escape from their burrows in June, at which time they may be found on the bushes.

Control - Soon after the female punctures the cane at the point where the eggs are deposited, withering and dropping of the tip is conspicuous. As soon as this is noticed the cane should be cut off well below the injury, so that there is no danger of leaving the grubs, which may have hatched before the injury is noticed.

The descriptions and different methods of treatment of the same, as taken directly from Cornell Bull. No.283 and Canadian Experimental Farm Bull. No. 56 will be given.

The Purple Cane. The purple cane variety is essentially the same as the black cap, in as far as cultural methods are concerned. The only difference is in the growth of the bush. In the case of the purple cane a more vigorous and larger plant is to be found. As a result it is best to set the plants farther apart, than recommended for the black. A survey of western New York in 1910 by the New York State College of Agriculture shows the advantage to be derived from setting the plants at a greater distance apart than in the case of the black.

Method	No. of farms	No. of acres	Yield per acre
6 ft. x 5 ft.	8	24	1,667
7 ft. x 3 ft.	11	65	1,739
8 ft. x 3 ft.	4	10	1,709
7 ft. x 4 ft.	4	12	2,324

The raspberry as a whole is one of the most popular bush fruits that we have. It ranks next to the strawberry in production, and the census of 1909 gace a total of 60,918,000 quarts as produced in the United States. This is practically one-fourth as much as the total strawberry crop, which was 255,611,000 qts. for the same year.

The raspberry as a fresh fruit is gaining in popular favor. The red cap is an established fruit and the demand will always be great. In some cases, where the location is favorable, it may be sold to the canning factory. It is not to be recommendsd as an evaporated product, as it dries to a dull and unattractive color, causing it to

be unpopular as a market fruit.

The black cap is only beginning to attract attention as a fresh fruit. Of late years pomologist have given more attention to its cultivation, with the result that the seeds are smaller and fewer in number, the fruit is larger, and the quality has been improved. Today however, it is sold primiarly as a canned and dried product, with the most importance being attached to the latter phase. This dried fruit is used extensively in cooking, and the demand in lumber and construction camps is great and increasing each year.

The purple cane as a fresh fruit is commercially unimportant. They are a large berry, very heavy producers, and have a rich flavor. To offset these characteristics, however, they have very poor carrying qualities and a dull and unattractive color which makes them unpopular as fresh fruit. Outside of the home garden for which they are particularly recommended, the purple cane varieties are used for canning purposes. When cooked they lose their unattractive appearance, and at the same time, maintain a flavor, of the red and the black which makes them very important as a canned product.

The future of the raspberry as a commercial crop seems to be good. This is especially true of the man who is willing to give the proper amount of time and attention to the crop. With the increased acerage, the insect and fungous diseases have spread so much, that the careless

grower is becoming discouraged and abandoning the industry. The demand for fresh fruit is growing each year. Also the canning and dried product industries are on the increase, and the demand for these products is always strong. With the increased number of varieties and the gradual improvement of all the species, it would appear, that for the careful grower, no fear need be paid to the future of the industry.

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The Currant

Saxifragrance. Saxifrage Family.

Family Ribes; low shrubs, often prickly with alternate digitately lobed leaves; flowers small; sepals five and petal like, on the ovary; petals and stamens five, borne on the calyx; fruit a small globular berry.

Currants; flowers in long racemes; no spines.

Ribes rubrum, Linn. Red and White currant. Erect bush, with broad cordate 3-5 lobed leaves with roundish lobes and not strong smelling; racemes drooping, the flowers greenish and nearly flat open. Berries red and white. Europe.

Ribes nigrum, Linn. Black currant; Stronger bush with strong scented leaves and larger oblong or bell shaped flowers with bracts much shorter than the pedicels; berries black and strong smelling. Europe.

Ribes Americanum, Marsh, (Ribes floridum) leaves sprinkled with resinous dots, slightly heart shaped, sharply three to five lobed, doubly serate; racemes drooping and downy, bracts longer than the pedicels; flowers large and whitish; calyx tubular and bell shaped; smooth; fruit round, Ovoid, black, smooth. Woods new England to Va. west to Kentucky, Iowa and Minnesota.

Ribes aureum. Pursh. Mis? or Buffalo currant. Large bush with long tubular yellow and very fragrant flowers; fruit blackish. Missouri west but common in gardens for its flowers.

Ribes sanguineum; Red flowering currant. Native of the Rocky Mts. and California. Cultivated for ornament, not valuable as an edible fruit.

There are two principal species in which our cultivated currants have been developed and these are both of foreign origin. These two species are Ribes rubum which is the red currant of Europe and the Ribes Nigrum which is the black currant of Europe. These species of currants from which our cultivated varieties have been developed, probably originated in northern Europe. The fruit is not mentioned by any of the old Romans or Greek writers, who were very careful to name all the plants of their time. DeCandole says "It was unknown to the Greeks and the Romans and its cultivation was only introduced in the middle ages. The cultivated plant hardly differs from the wild one.

That the plant was foreign to the south of Europe is shown by the name Groseillier d' outreiner (currant from beyond the sea) given in France in the sixteenth century."

The black, red and white currant was known to the inhabitants of northern Europe for many centuries as it grew in the wild state, in northern Europe, Siberia, Lapland and Scotland. However, it attracted but little attention until the last one hundred and fifty years, and it has only been since that time that its cultivation has taken place.

The English name currant was formerly Carrans

and the name was given to the fruit, as it resembled the Zanta grape, which is called Corinths on the English market, as it was at one time almost entirely imported from Cornith.

In the Accounts of Fruits, by Phillips and published in 1557, there is no mention of the currant and neither does Turner who published a list of cultivated fruits in the same year. The first mention we have of this fruit was in 1597 when Gerrarde spoke of it as a smooth stemed gooseberry and said that its cultivation was rare.

Downing says "The fruit of the original wild species is small and very sour, but the large garden sorts produced by cultivation and for which we are chiefly indebted to the Dutch Gardeners, are large and of a more agreeable sub-acid flavor.

There are many species of the wild currant in America, but only three have given varieties which have been cultivated for fruit, and none of these are important. The three varieties mentioned are :

Ribes aureum (Missouri or Buffalo currant)

Ribes Americanium or floridum (Wild black currant)

Ribes sanguineum (Red flowering currant)

Bailey in "The Evolution of our Native Fruits" in discussing these varieties says "Of these varieties only the Crandall is generally known and even this has little commercial or even domestic value. This is Ribes

aureum, the species generally known as the Missouri or Buffalo currant. There are a few other named fruit bearing varieties of this species, but they are mostly confined to the dry regions of the West. It grows wild from Missouri and Arkansas westward. The Crandall currant was named for R. W. Crandall of Newton, Kansas, who found it growing wild. It was introduced in the spring of 1888 by Frank Ford and son of Ravina, Ohio. This type of species of currants undoubtedly has great promise as the parent of a new and valuable race of small fruits. The Crandall, however, is too variable to be reliable. Comparatively few plants produce abundantly of large fruit, while many of them bear fruits but little larger than occasional plants of the common flowering currant, to which species the Crandall belongs".

"In the Plain regions the Missouri currant type has greater promise, not only because it thrives better, but because common currants do not, but the varieties will need to be much improved by careful selection.

There are four methods of starting the currant seed ; seeds, suckers, layers and cuttings.

Propogation by means of seeds is seldom employed, except in the development of new varieties. The currant reproduces itself truer to form than do most fruits, and this coupled with the fact that it takes but a short time to come into bearing makes it an interesting study for the plant breeder. Fuller recommends the following

plan in propogating the currant from seeds :

"This method is seldom employed, except in producing new varieties. The fruit should be gathered when fully ripe, always selecting the largest berries, and from the earliest and mildest flavored kinds, as the currant being naturally a very acid fruit, the aim should be to produce sweeter varieties.

The berries may be dried and the seeds preserved in the pulp until the seeds are wanted, or be crushed and the seeds washed out. They will grow more readily if not allowed to become too dry, although drying is not so injurious to them as it is to many other seeds.

Gather the fruit when ripe and wash out the seeds, then mix them with pure sand, and put in boxes or pots, and bury them in a shady place, such as the north side of some building or fence where they will remain cool or frozen until the ground in which they are to be sown is in a condition to receive them. If they are placed in a place where the sun will reach them they are very likely to germinate either during the winter or as soon as the frost leaves them in the spring. Often before the ground would admit of their being planted. If the seeds are frozen after they are sprouted, it will usually destroy the germ and prevent further growth. With many persons the cause of failure in growing the currant and gooseberry from seed is that they either place them in a situation where they sprout and cannot grow or where too warm and wet, and when the seeds are to be taken out and sown in

spring, they appear to be sound, yet their vitality is gone."

The method of setting out suckers that spring up from the old bush, is still practiced by some people, but the idea is not so popular today as plants produced in this manner are not so vigorous and hardy as those produced from cuttings.

Another possible method is the means of layers, branches that are bent down to the earth and then covered with soil will readily take root. If this method is adapted it should be done in the spring and then the layer will become well rooted by fall. The end of the branch should be left uncovered and only that portion covered which is desired to take root. In the fall, the new growth is separated from the currant plant and is then ready to set out as a new bush.

Commercially, the currant is propogated by means of layers. This method is the cheapest and gives the best results and the other methods discussed should not be considered from a commercial point of view. In propogating by means of stem cuttings, Card in Bush Fruits gives the following plan :

"Currants are readily propogated from hard wood cuttings made from well ripened shoots of one season's growth. The cuttings may be taken and planted in either the fall or the spring, but the common custom among nurserymen is to take them in early autumn as soon as the leaves mature. The leaves commonly begin falling as early

as August, but they are frequently stripped a week or so before the cuttings are taken which is usually done the last of August or the first of September. They may then be planted at once or tied in bundles and buried upside down, with two inches of soil over the budds. In this position they may callus, and even form roots before winter. They may be taken up and planted later, removed to the cellar and buried in sand during the winter, or be given an additional covering and left where they are until spring. If planting is deferred until spring it must be done very early as they begin growth at a low temperature and must receive attention at the earliest possible moment. The common practice is to plant in nursery rows soon after the cuttings are taken. They are said to root more quickly, if packed in damp moss, a week or two before planting. The cuttings are ordinarily made from six to eight inches long, though the older writings recommend them to be one foot long. The base should be formed at the clean square cut just beneath a budd. The top is commonly a slanting cut some distance above the uppermost budd. Planting may be done by means of a spade, but it is more conveniently and rapidly done by plowing furrows and setting the cuttings against the land side of the furrow. One or two budds only are left above the surface of the ground and the arth should be firmly packed about the base of the cuttings. If set early in September, many of the plants will form roots and establish themselves before winter, being in condition to begin

growth immediately in the spring. As freezing weather approchaes a shovel plow will sometimes run through the rows, in order to throw the earth toward but not over the cuttings. This leaves a depression along the roads and the plants are then easily protected by covering with straw or coarse manure. Mulching in some form is essential during the winter, if currant cuttings are planted in the fall. Rich land should be selected and heavy dressings of well rotted manure are useful."

The currant will grow and produce fruit on most any kind of a soil, and of this New Jersey Bulletin reports "fruits of this class are rather gross feeders, and hence will do well on deep rich soil, preferably clay loams. They delight in moist, cool situations on well drained land.

For the years 1893 and 1894, the ten growers having sandy soils, reported yields ranging from 320 quarts to 5750 quarts per acre, averaging 1568 quarts. The eleven growers having clay loams reported yields varying from 100 to 7500 quarts and averaging 2692 quarts per acre, or a difference in favor of the clay loams of 1124 quarts.

The majority of the plantations reported are upon high land. Nine out of forty-two have low land. The danger of frost is therefore lessened -- fifteen per cent only reporting injury. The ideal location should be a clay loam soil on rather high land, with a northern or northwestt exposure. The elevation is immaterial if near a large body

of water. Currants delight in partially shaded situations and are well adapted for setting in orchards of larger fruits."

Currants should not, however, be planted in low lands where a frost pocket is liable to form, because then the entire crop may be lost by injury of frost.

The currants is a gross feeder and a shallow grower and thus requires a great amount of plant food and moisture. As a result manure of any kind and in most any amount, can be added to the land. The preparation should be thorough as the maintainment of the moisture content is of importance. The soil should be plowed in the fall and quite deep and if hard pan is present, it may be well to use a sub-soil plow. If possible, it is well to have had a crop of cow peas or any crop that has required intensive cultivation the season previous to planting.

The planting may be done in either the fall or the spring, but the fall plowing is to be preferred. The reason of this is caused, in the main, by the fact that the currant starts its growth so early in the spring. However, in the west where the winters are more dry and open the fall planting may not be best, unless the plants are thoroughly protected. The spring planting no matter where the location happens to be, is quite as successful as fall planting, if the plants are set out before any growth has started. If set out after the growth has started, however, the plant will be retarded during the

first season.

The distance to plant berries with the opinions of different growers and the method of ultivation practiced will influence the method followed to a great extent. The most common method is that of planting in rows six feet apart and then three feet apart inthe rows. However, this will not allow cross cultivation and more hand work will be necessary.

There are some growers who prefer to cultivate both ways during the early life of the patch and in this case the bushes should be set five to six feet apart in the rows and four or five feet apart in the rows.

Still other growers prefer to cultivate during the entire life of the patch and in this case the square system of planting should be used. Plants set five feet apart each way will give excellent results and will be kept cleaner with a minimum amount of work.

In planting, Card gives the following directions : "The land should be in a fine mellow till as deep as plowed. It should then be marked both ways with furrows in one direction. It will be all the better if these furrows are made deeper than necessary to receive the plants, in order to insure their being set in a well fined bed. The setting is easily done by placing the plants against the land side of the furrow and drawing the earth about them, packing it firmly about the roots with the feet. No one point is more essential than this o

thorough firming of the soil about the roots. A layer of loose, fine soil should be left on the surface to act as a mulch and prevent the pack soil underneath from drying out. Ths remainder of the furrow may be left to be filled in as cultivation progresses, later on. One year old plants are quite as satisfactory if vigorous and well grown and cost less money. They are easily set meet with little check in transplanting and make a better growth than if left in a crowded nursery row during the same time.

As before stated the roots of the currant run close to the surface of the soil and the cultivation should therefore be shallow or the roots of the plants will be injured. At the same time the bush is a heavy feeder and requires plenty of plant food and moisture. As a result intensive cultivation should be practiced, so as to preserve the moisture content and maintain the capillary activity of the soil.

The first year or two after planting and before the root system is spread out to any extent deep cultivation should be practiced with any of the ordinary shovel tooth cultivators. The common hand hoe should also be used several times each year to keep out the weeds and also to keep a crust from forming around the plants . After the first couple of years when the roots have begun to spread shallow cultivation is essential. The ordinary shovel tooth cultivator is liable to injure the plants, and should not be used, Inasmuch as the soil only needs to be stirred lightly to keep a dust mulch over the bed,

a light harrow tooth cultivator or a light spring tooth cultivator with the teeth set well back, is to be desired. The cultivation should be practiced each year and as often as possible until at least the latter part of August.

The currant does exceptionally well when given a mulch treatment which is probably due to its being a shallow feeder. The material used in mulching is any coarse grass or heavy cover crop that may be best utilized by the grower. The plan followed by some is to cultivate several times during the spring and early summer and then mulch the surface during the balance of the year. The mulch not only takes the place of cultivation by preserving the moisture content but also eliminates the weeds and keeps the field clean. However, owing to the mulching material being so expensive, the practice is not to be followed, except in the home garden, where cultivation must be done by hand or is neglected to a great extent.

The currant is a heavy feeder and requires an abundance of plant food. Agsin, since it is a shallow feeder the food elements should be applied in such a manner as to make them readily available to the roots, which are small and of a fibrous character.

The question of fertilizer has not been experimented with to any extent, but it is generally agreed that heavy applications of manure are of importance.

As regards the application of manure Cornell Reading Course reports the following survey which shows the benefit to be derived from applying manure :-

	Farms	Acres	Yields per Acre	Incomes per Acre
Manure	9	26.35	2,471.0	$144.23
No Fertilizer	7	3.33	2,078.2	134.45

Card in remarking on fertilizer says, "The currant is a rank feeder and needs a rich soil, with liberal fertilizing. Yet the roots are small and fibrous, and do not extent far for their food. It must be supplied in liberal quantities and close at hand, while no fruit will live and thrive under greater neglect than will the currant. It is equally true that no fruit will more quickly or fully respond to liberal treatment. Too often it is relegated to fence corners, without care or culture, there to battle with sod and currant worms from year to year. Little wonder that the currants are sour and small. Liberal applications of stable manure preferably in the fall, supplemented with the addition of wood ashes or potash in the form of commercial fertilizer in the spring are always in order. Currants contain 11 per cent of phosphoric acid and .27 per cent of potash, while stable manure contains only about one-third more potash than phosphoric acid, which shows the need of additional potash. There is little danger of too rank growth or diminished fruitfulness from an excess of stable manure. Observations from Massachusetts Experiment Station, Bulletin No. 7, show

that the desirable quantities of the fruit were increased in every case of the application of potash fertilizer. A comparison of sulphate and murate of potash at Geneva Experiment Station, showed no practical difference in favor of either. To sum up, fertilizing forthe currant is not different from that of other fruits, except that it needs to be more liberal than in most other cases if satisfactory returns are to be obtained."

The New Jersey report for 1903 and 1904 gives some interesting results of commercial fertilizers on currant plots. On December 18, 1903 barnyard manure was spread over Plots 1 and 4 and on the 21st bone, potash and acid phosphate on Plots 2, 3, 5 and 6. May 31st cultivated and 1000 pounds of oyster shell lime applied to all plots. On May 6th nitrate of soda added to Plots 3 and 6.

Currant fertilizer plots

Variety	Unirrigated			Irrigated		
	PLOTS					
	1	2 oz.	3	4	5	6
Fays Prol	394	882	157.5	315	186	269
Red Dutch	892	777	901.8	1178	737	1207
Victoria	826	721	883	993	697	904
WhiteGrape	119	103	123	168	67	151
Eq. Qts.	111.5	97.1	103.2	132.7	84.3	126.5
Total Qts.						
1898	13.3	3.4	8.8	17.8	11.3	9.4
1899	41.2	37.5	49.8	51.8	51.6	50.9
1900	67.2	61	54.9	82.0	68.1	60.5
1901	109.1	98	108	129.8	105	107.3
1902	130.9	119.0	135.6	143.2	113.8	150.2
1903	75.2	60.8	62.4	82.9	59.3	70.1

Of the three treatments, it can be seen that manure is first; potash, acid, phosphate and nitrate of soda is second, and bone, potash and acid phosphate last.

In conclusion it would seem that there is no definate law regarding the application of fertilizer, with the exception that al seem to agree that manure in large quantities is beneficial. As regards commercial fertilizer, it would seem that every grower must determine for himself, according to the character of his land, those forms of plant food that should be applied in the form of commercial fertilizers.

The pruning of the currant is of great importance and C. S. Wilson gives the following directions : "A knowledge of the fruiting habits of the plant is essential to an intelligent understanding of the method of pruning. Some fruit is borne on the wood of the previous years growth near the base, and often this fruit is the largest. Wood that is two or three years old gives the most and the best fruit. Older branches produce fruit, but the amount is less and the size of the berry is smaller. The aim of the pruner then should be to remove all branches over three years of age, to thin out the bush in order to admit the sunlight and permit good air circulation, and to head in those branches that make a long and irregular growth.

Beginning when the plants are set the pruning would be somewhat as described below. The directions

are given in definite form and detail to make them the most useful to the reader. Variations will be necessary for different varieties and conditions. The grower must allow for such variations as are needed.

At planting; -- (first spring) The plants should be headed back to a single branch which is headed back to five or six budds.

(Second spring) -- Five or six branches are chosen to make a frame work of the bush; the others are cut out. If any of these five or six branches have grown too long, they should be headed in so that all are of a uniform length.

(Third spring) -- The plant is thinned out to a desired form and the branches that have grown too long are headed in.

Bearing plant -- All wood over three years old, should be removed and the branches thinned out if necessary. Heading in is not desirable and should not be practiced exceptwhen a branch has made such an abnormally long growth that the balance of the top id destroyed in which any branch may be cut back to the others. Low branches that touch the ground should be removed, because they hinder the circulation of air and the berries produced thereon would be dirty. A dead and diseased branch should always be cut out. The pruner should aim to secure an open head, keeping in mind, however, that the weight of the berries will bend the branches somewhat. An open head is helpful in the control of disease, since it insuresa

freer circulation of air and more sunshine. The pruning is usually done in the spring although it may be done in either the autumn or spring.

The currant is picked as soon as the cluster shows a uniform color throughout and this occurs the latter part of June and the month of July. Only one picking is made of the fruit and it is taken clean at this time. A currant will hang on the bush for many days but only seven to ten days are available for picking.

Women are usually employed to do the work, and are paid from three-fourths to one cent per pound. Some, however, are paid by the basket and in this case usually receive from one and one-half to two cents per quart.

The picker must observe several rules in gathering the fruit and care must be exercised to gather only when dry. The fruit if properly handled is one of the best keepers of any of the small fruits, but if gathered when damp will spoil quite readily when packed. The fruit bears in clusters or racemes, and the picker must sever the stem with the thumb and forefinger and not carelessly tear it away with the bush with his hands and thus crush the fruit.

The currant is handled as are most of our oth er small fruits and is sent to the market in baskets holding six to eight pounds and in boxes holding a quart. During the last few years the common grape basket has been gaining popular favor as a method of shipping to market. Prior to this the fruit was marketed in quart boxes and

put up in crates of a bushel. The fruit is either sold direct which is to be greatly desired or else passes through the hands of the commission men. Since the industry is not largely developed and there are but few large commercial centers, the fruit growing associations are of but little importance. It would seem, therefore, that a reliable commission man is the best means ofdisposing of the fruit to a retail market, unless it is of a local nature.

There are certain sections of the country however which of late years have developed large canning industries. Selling the entire crops to these factories is the easiest method of disposing of the fruit. In this case the fruit is sold direct and the importance of having the fruit put up in a neat, clean and attractive manner is not so important. Here grading is not desired and the quality of the fruit may not be so good as when placed in the retail market.

From the discussion under pruning, it is seen that the bush is renewed every three years. From this it would appear that the plant would continue to thrive and bear fruit for an indefinite period. It is true that the plant will continue to bear fruit for quite a long time, but after eight or ten seasons of bearing, it does not devote so much energy to the production of high class fruits.As the result practical growers start a new bed every eight or ten years, finding that the initial cost of starting a new bed is not great and that the

benefits derived are well worth the trouble involved.

The Black Currant.

The treatment of the black currant is but little different from that of the red. It requires a little more room as it grows a little taller, but when planted by the hill system and cultivation can be practiced both ways, it will have plenty of room in which to thrive.

The directions for the red apply equally well to the black with the exception of the pruning. On the red the fruit is borne on two and three year old wood, while with the black it is mostly grown on the previous season's wood. As a result the pruning in case of the red is done with the idea of preserving two and three year old wood, while with the black the idea is to preserve the previous season's growth.

Diseases and Insect Pests.

The following diseases and insect pests are taken from Cornell Reading Course Vol. I, No. 22 - The Culture of the Currant and Gooseberry, by C. S. Wilson :

Diseases

Cane blight or wilt.

This disease is very destructive in the Hudson Valley. It is caused by a fungous which fills the bark in places and this colors the wood. The canes die suddenly while loaded with fruit and leaves. No definite line of treatment has been established but the following is suggested: Beginning when the plants are small, the patch should be gone over every summer and all canes showing signs of disease should be cut out and burned.

Leaf Spot.

This is a fungous disease that is first noticed about mid-summer, when small brownish spots appear on the leaves. Sometimes the disease is serious affecting a large part of the foliage and causing the leaves to fall.

Leaf spots may be controlled by application of Bordeaux, 5-5-50 but it is doubtful whether the disease is sufficiently destructive on the average to warrant so much expense. If the disease is expected it is suggested to use Bordeaux and arsenate of lead together when spraying for the currant worm. In case it becomes necessary to apply a spray at a time when Bordeaux will color the fruit Ammoniacal cooper carbonate may be used to advantage.

Currant Anthracnose.

Currant Anthracnose.

This disease which may be mistaken for leaf spots affects the leaves, leaf stalks, young branches, fruit and fruit stalks. On the leaves it appears during the month of June in the form of small brown spots. Soon the affected leaves turn yellow and fall prematurely to the ground. The fruit may also wither before ripening properly owing to lack of food or moisture.

Spraying with Bordeauz misture 5-5-50 is recommended as an aid in controlling this disease. It would be wise where Currant Anthracnose is troublesome, to spray the bushes thoroughly before the leaves appear, using lime sulphur at scale strength. A second spraying should be made with Bordeaux when the leaves are unfolding, and successive sprayings at intervals of ten to fourteen days until the fruit is nearly full grown; there is danger of its being discolored by the spray when ripe. Arsenate of lead should be added to the mixture when the first brood of the currant worm appears. A thorough spraying after the fruit is harvested is desirable.

Insect Pests.

Currant worm.

The currant worm is the most serious of the insect pests. The adult is a four winged wasp-like insect which may be seen flying about the bushes in the early spring. The eggs are deposited along the midribs and on the under sides of the leaves. In a few days the eggs hatch in

small green black spotted larvae, which feed on the leaves often defoliating the entire bush. A second brood hatches in the early summer.

The application of poisons, such as arsenate of lead, or paris green in the usual proportions is recommended when the worms first appear. In case it is necessary to spray after the fruit is half grown, hellebore should be used.

San Jose Scale.

This pest is very prevalent on currant bushes. A dormant spraying of lime sulphur at winter strength should be used.

Unlike the strawberry the grower of the currant has but little over fifty varieties to choose from, and of these many blend into each other, with no great points of contrast differentiating them one from the other.

In 1908 the New York State Agricultural College made a survey of Monroe County, and in 1910 of western New York, as regards the preference of the different currant varieties.

Survey of Western New York in 1910.

VARIETY	No.of farms
Fay	15
Wilder	7
Cherry	7
Versaillse	2
Victoria	2
Red Cross	1
Pomona	1

Survey of Monroe County in 1908.

Fay	13
Red Cross	3
Cherry	3
Victoria	3
Perfection	2
Wilder	1
Pomona	1

"Both of these tables show the preference of the grower. The value of the varieties on the market is also

important. Many commission men in the large cities were asked to indicate the most popular varieties from the considerations of the buyer. The Cherry ranked first with the Fay second. No mention was made of the other varieties. It is probable that the consumer gives very little attention to the particular varieties."

"A study of the above figuresindicates that reliable varieties for commercial planting are the Fay, Wilder, Cherry, Red Cross, Versaillaise, and Perfection. In setting these varieties the grower is taking no risk as they have stood the test for several years. It is suggested however that the grower test some of the newer varieties that seem adapted to his soil and climate. It is probable that newer varieties which prove themselves more valuable for commercial purposes will in time partially or wholly supplant the older ones."

The above varieties are all of the red, which is the most popular and widely grown today. Why this is cannot be explained, unless like so many other fruits, the people have simply taken a fancy to it.

The White currant is not grown commercially, as there is but little demand for it, As a rule they are less acid than the red and the flesh is of a richer flavor. It would seem from this that the White will eventually become an important commercial product, but at present it will only be well to grow a few in the home garden. The White Dutch, White Grape and White Imperial are to be recommended.

The Black currant is not popular in this country and is grown only to a slight extent. This fruit is not so strongly acid as either the red or the white variety but they have a peculiar, repugnant, chinch bug like odor and also a very peculiar flavor, which causes them to be very unpopular. However, through familiarity the taste is becoming acquired and appreciated, and seems say to say that the market will demand their presence to a much greater extent within the next few years.

The currant is not grown commercially to any extent in the United States. This is caused in the main by the fact that it is seldom eaten as a fresh fruit on account of the extreme acidity of most varieties. The currant is used primarily in the making of jelly and jam though it is often mixed with other foods that has a tendency to be flat.

Exteme acidity of the currant plus the rich flavor of the other fruits makes an ideal combination. When canned alone, the qualities are preserved causing it to be readily available in the winter as well as in the summer.

The currant crop for 1909 in most states both in acerage and production, was smaller than in the preceding census of 1899. The acerage is concentrated in the Middle Atlantic and the East North Central divisions and New York is the only state in 1909 to produce over 1000 acres of the currants.

However, the fruit is a staple crop and there is

usually a steady demand for the same. A few years ago the market was flooded at times and as a result, the culture was stopped to a great extent. Since the canning industry has become important, however, the demand has received a new impetus and the supply is now falling behind.

The currant has many good qualities to recommend it and among these are its perfect hardiness to withstand almost any freezing temperature; its productiveness; its good shipping and keeping qualities and its ability to bear a crop most every season.

Since there is a strong demand for the fruit and growers obtain good profits in its culture, it would seem that even greater opportunities were in store for the man who will give more intensive culture to the fruit.

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The Strawberry.

The strawberry is one of the most favored fruits today, tho it is one of the newest and has received but little attention ere the beginning of the nineteenth century. The orgin of its name is not definately known, and several theories have been advanced. One is that the children of the ancient days used to string them on straws to sell. Another is that the runners of the plants gave the appearance of straw scattered on the ground. Cuthill in his "fruit and Vegetable Annual" says"- "The strawberry up till the Dutch gardiners arrival in England was called the wood berry. One year a very heavy hail storm came over London and spoiled all of the Woodberries with grit and mould; next year the gardiners laid straw under them, and from that time they have been called strawberries."

The strawberry belongs to the Rose family and the name of the genis is Fragaria. A.S. Fuller in the "Strawberry Culturist" describes the gehis as follows. "A genis of low perennial herbs with runners and leaves, divided into three leaflets; calyx open and flat; petals five; white stamens ten to fifteen and some times more; pistils numerous, crowned upon a cone like head in the center of the flower. Seeds naked on the surface on an enlarged pulpy receptical called the fruit".

Bailey's classification and description divides the Fragaria into four species as follows.

	----Garden strawberry.
Fragaria moschata	Hautbois Strawberry.
Fragaria vesca.	Alpine. Strawberry.
Fragaria Virginiana	Virginian.

Fragaria Chiloensis;Garden strawberry.Low and spreading but stout.the thick leaves somewhat glossy above the bluish white beneath,rather blunt toothed;flower clusters short,forking,the pedicles strong and long;the fruit large and firm, dark colored,with sunken akens.

Fragaria moschata;Hautbois.Taller ,usually diciceous, more pubescent,the calyx or hull strongly reflexed from the fruit,berry a dull red,musky.Cultured forms rarely seen in America.

Fragaria vesca;Small. very sparsely hairy,the leaves thin and rarely light green, very sharply toothed,flower cluster overtooping the foilage;small and errect,forking;fruit slender and pointed,light colored(sometimes white)the akens not sunk in the flesh.Cool woods.Common north.

Fragarina Virginiana;common field strawberry.Stronger darker green.loose hairy,the leaves with more sunken veins and larger and firmer;flower clusters slender but not over topping the leaves,fruit with drooping pedicles,fruit globular or broad,conical,with akens sunk in the flesh,light colored, Very common.

The strawberry was not cultivated by any of the ancient peoples.The Roman writers never mention it when speaking of their cultivated fruits.Virgil only mentions it when warning the shepards against the concealed adder"when seaking flowers and strawberries."

The first mention of the wild plants being transferred to the garden was during the fifteenth century.In 1593 Thos Hyll, speaking of the straeberry in England,write as follows"Strawberries be much eaten at all mens tables in the summer with

wine and sugar,and they will grow in gardens until the bigness of a mulberry."

Of the species mentioned by Bailey,only two are of any great importance.The Fragaria Chiloensis and the Virginia,have been most important as regards the improvement of the fruit. Fragaria vesca which is common to both North America ane Europe is of less importance and has not entered into the improvement of the strawberry to a gr great extent.The Hautbois strawberry was first grown in Germany during the early part of the seventeenth century.It is very closely allied to the Alpime which is the variety of the Fragaria vesca.

The chiloensis is a species common to Chili and it was often cultivated in that country.In 1716 a French traveler by the name of Freezer,introduced the native strawberry of Chili into France.Here it received cultivation in the Musieum of Natural History.Thru the efforts of Phillip Miller,this variety was introduced into England in 1729.

The Fragaria Virginiana is the native strawberry of North America,and is a native of both Canada and the eastern part of the United States.It was introduced into England in 1629.Efforts to improve the species were not very successful.tho some few improved varieties were to be found in England,during the early part of the nineteenth century.

In 1750,the Pine variety appeared,but from whence it came nobody knows.Its orgin is unknown,but it is supposed tohave come from either Dutch Guiana,Virginia or Louisiana.All three theories have been advanced,but none have been proved or disproved.It was supposed by many to be a hybrid between the Virginiana and the Chiloensis,but today most botanist think it

To be a direct decendent o the Chilean variety.

Experiments to improve the strawberry were not begun till the beginning of the nineteenth century.In 1810 Mr.N.Davidson raised a variety called the Rosebery.The Downton was brot by T.A.Knight in 1816 and Atkinson the Grove End Scarletin1820. However the first variety that showed any marked improvement was known as Keen's Seedling,which was first exhibited in London in 1821.From 1810 to 1830 there were not over a half dozen improved varieties to appear in EnglandHayatt however produced the British Queen and this variety led all others for over fifty years.

In America the first great improvement of the strawberry appeared in 1834 when Mr,Hovey of Boston Mass.exhibited the "Hovey" strawberry.This was probably a cross between Keen's Seedling and the Mulberry which was another English variety of the Pine type.The Hovey was the first commercial variety to be raised in the United States.Prior to the appearance of the Hovey the varieties grown in the United States had been imported from either England or Europe,and none of them had given satisfaction.In 1857 John Wilson of AlbanyNew York orginated the variety known as"WilsomsAlbany",and even today some people grow this variety when they desire a fruit that is indifferent to cultivation.Sihce the appearance of the Wilson" there have been hundreds of varieties to appear i the United States.Many of these have been inferior to the Wilson but the tendency has been to build up.As a result we have a berry today,tho not the ideal,that has been improved,as regards quality,size and productiveness.

PLANTS.

The strawberry is one of our easiest cultivated plants to grow.Nature has arrainged for the reproduction of the plants by means of seeds and runners,which are really new plants,that are produced on certain points on the runners.

The method of seed propogation is that adapted by the wild strawberry.Here the fruit fipens and the seeds fall to the ground,and germinate,either during the summer or during the following spring.Gardiners have taken advantage of this method in producing many new varieties.

The latter method,or propogation by means of runners is to be preferred however.The plants may be obtained from some nurseryman or from some old bed.Only strong and healthy plants should be selected for planting the new bed and they should be taken from a bed that has been planted the previous year. these beds should have thorough and intensive cultivation during the season,as this insures strong and healthy plants with vigorous roots.In selecting the plants Michigan Agr.College Bulletin No.163 says"Only the plants from the runners should be used for the new plantation;these have yellowish white roots,and thus can be distinguished from the older plants,which have a strong stem at the end of which are black or brown roots,many of which are dead or brokenIf plants,of good quality which can be depended upon to give large crops,are desired ,those selected for planting should have good crowns and well developed roots.As a rule only the first plants on the runner should be used.When the plants are allowed to layer freely, a large number of weak sets are produced,and althoughthese will grow,they give a small yield,and the practice if persisted

in,will result in the running out of the variety.

The best plants can be secured from plants that have been grown but one year,and which have not as yet fruited.The practice of obtaining plants from old plantations,tho used by many persons is not a good one,as continued fruiting cannot fail to sap the vitality from the plants,and runners produced by them will not give as good results as those from young plants." Poor plants are dear at any price and should neverbe used if good onesaare to be obtained.

When the plants are taken up ,prior to transplanting or to shipping,the old leaves and runners should be removed,and the plants bunched;the method usually followed is to remove all but two or three of the healthiest leaves and all of the runners.This prevents a too rapid transpiration of the water from the plants,ere it has becom firmly established in the soil.It may also save the plant from drought in many cases.In bunching the plants, the roots are so placed that all of the roots lie in the one direction.They are packed closely side by side in either boxes or baskets and with the roots down. After being packed they should be stored in a cool and dark cellar if possible,and kept covered at all times with moistened gunny sacks to prevent drying.They shoul be kept here till time for planting or shipping.

If the plants are ordered from the nurseryman they should be ordered as near to planting time as possible.Often times however ,conditions arise that make it quite impossible to plant at once.Nursery plants are usually received in bundles of twentyfive to fifty plants each.As soon as they arrive the bundle should be ppened,other wise they are liable to

become dry or heated and thus cause many of the to die.In case the plants cannot be planted as soon as received,they sh should be heeled in.Central Experimenta Farm.Bull. No.62 of Ottawa gives the following method for heeling,"Open a trench sufficiently deep to cover the roots of the strawberries well, and so that the ground will be just above the ground.Now place the plants close together but in a single row in the t trench.Another trench is now opened parallel to the first and about six inches from it,using the soil to cover the roots of the plants in the first trench.This soil should be firmly packed or tramped about the roots so that the moisture will come into close contact with them.If loosely heeled in they are very likely to dry out and the plants will die.Other trenches should be dug parallel to the first two,if needed.By the time the field is ready for planting,these heeled in plants will have made new roots and be in a better condition for planting than if they had been set out at once."

The fact that there is sex in plants,is of prime importance to the strawberry culturist.In some cases the grower has some particular variety that he likes best,and as a result decided to discard all others.However care must be taken thatthis one variety will pollenize itself ,or the ensuing crop will result in a failure.There are several hundred varieties of the strawberry,but all of them will not pollenize themselves,and other varieties must necessarly be planted in close proximity to insure cross pollination.In Bulletin No163 of Michigan Experiment Station,is an account of perfect and imperfect flowers and their uses as regards cross pollination ,which is here quoted.

"The flowers of many varieties of strawberry possess no stamens,and if these kinds are planted by themselves,the fruit produced will be small,irregular and of no value;these varieties are commonly spoken of pistillate ,or imperfect flowers. there are also a large number of varieties that in addition to the pistills ,have more or less stamens,but,as the amount of pollen they produce is small,it will be best to depend upon perfect flowered kinds tofertilize them.In some seasons they may develop all that is required,but in otheos,some varieties will produce an amount so small that it will not suffice to fertilize the pistils.Aside from the fact that different amounts of pollen are produced by by different varieties and that in the same variety it changes from year to year,it also happens that the amount required for the proper fertilization of the ovules varies in different years,as when the weather is warm and plwasant a much smaller quanity will suffive tha when it is cold and wet.Still other varieties have a considerable humber of strong stamens that produce large amounts of pollen, and if th pistillate or nearly pistillate kinds are grown,it will oe adviseable,to have at least enery fifth row of these strong staminate kinds that flower at the same time.Some growers living in sections near the lakes where the air is moist and where the fogs prevail,find that in order to secure perfect fertilization of the pistillate varieties,it is well to have every third row of some variety that produces a large amount of pollen".

While it does not hold true in all cases,careful examination of the list of productive varieties of strawberries,will show that imperfect flowered kinds as a rule are more productive

than those with perfectflowers.This has been ascribed to the fact that the staminate kinds have exhausted themselves,in part at leadt in the production of pollen,and are consequently able to develop but a small amount of fruit.However,as the rule does not hold true in all cases,the merits of the individual varieties should be considered in making the selection"

In selecting the site for the strawberry bed,there are a number of environmental factors to be considered,the principle ones beingsite,air and water drainage,exposure and soil.

In selecting the site land with a slight and gentle slope is to be preferred over a level piece of land.The advantage to be secured lies in the air and water drainage.Never plant the plantation so that a pocket of air will be formed.Air drainage is essential for the best results,and if a pocket is formed on one side of the bed,the air will cease to circulate and t thus become stagnant,anf this often results in killing frost.

The strawberry contains a large amount of water and at the same time ripens when a drought may be expected.As a result the location selected should be one that is fairly retentive of moisture.The soil however should be thoroughly drained,as where the water lies close to the surface,the plants are liable to suffer in either the winter or the summer.The water should at no time stand upon the soil,and the water table should be at least two feet below thw surface of the soil.

If however a site must be selected that is level and has no natural slope,and is not well drained,the difficulties may be overcome by installing some artifical drainage system. Only the "Covered "or the "Underdrained system should be

considered and care must be taken that enough tile are placed under the bed to carry off all surplus water. If the level land is lower than the adjacent territority, and thus lacks proper air drainage as well as water drainage, it is not advisable to use it.

A.E.Wilkinson, speaking of the exposure of the strawberry plantation in "Modern Strawberrt Growing" remarks; "The southern slope should always be selected for early fruiting, where the plants are held back till all danger from frost is past, a northern slope is best this slope however should be some what protected in our northern states, by either a tree, shrub, or building wind break; other wise the plants will suffer greatly from cold high winds.

One of the principle drawbacks to the southern exposure, is the frequent freezing and thawing, especially of the honeycombed varieties. This causes heaving of the plants and destroys great numbers yearly, by breaking the roots of the plant, and t then leaving the plants and some of the roots exposed to the air and sun. Owing to the warmth of this location, blossoms start early and are then some times killed by the late frost.

SOILS.

The strawberry will do well on a wide range of soils as evinced by the fact that it is a very cosmopolitan fruit and that it will thrive in almost any part of the world. Some soils are better adapted to the cultivation of the strawberrt than others, tho it is possible to find some varieties that will thrive in most any soil. As a rule the sandy soils or the light sandy loams should be avoided, as the fruit will often times suffer from a lack of sufficient moisture. The stiff heavy clays are also very unsatisfactory, and can seldom be properly worked

ih the spring;if not cultivated the soil will bake,a crust will be formed,and the plants are more liable to suffer from a lack of moisture,than those in the lighter soils.

The strawberry is a very vigorous and rapid growing plant and demands plenty of moisture and a liberal supply of plant food.The ideal soil for strawberry culture therefore,would seem to be,a light rich loam,with an abundance of humus and well drained"Moremn Strawberry Growing,as regards the selection of a site says;"The ideal soil,is a good rich humuscontaining loamy soil,which is well drained."

The one condition of soil on which it is never advisable to plant strawberries,is fresh plowed old sod.Several reasons are back of this;first,an air space between the subsoil and the plowed sod.This is practically impossible to overcome,even after several rollings and discings.Second,the large number of insecte present,especially the June bug larveor commonly known "White Grub"This fellow eats off the roots of the strawberry plant,killing large areas which have been planted in sod.Third, Owing to the first reason.lack of water in the pop soil,as th there is a break between the top soil and the sub soil and th there fore a kack of rise of water.Even with several wateringg the plants are not saved,where there is a break in the capillarity.

The question then arises,if the only vailable place for the strawberries is the sod,how shall one go about in order to plant the next spring?Fall plowing an not inverting the sod is the solution?This kills the grubs,starts the decay or t the breaking down of the sod,and gives a greate chance for connection between the upper soil and the subsoil.The prep-

eration before planting,must be as thorough as possible.

CULTURE.

The grower of the strawberry,wheather for the commercial market of for home consumption,desires a maximium yield and with this idea in view he desorys to those methods of cultivation that will give the best returns.It is well for the man who thinks of setting out a strawberry plantation,to look ahead and plan for two or three years ere planting.The strawberry plant requires intensive cultivation and in return gives large yields;there fore the preperation of the soil should be thorough.

With this idea in view ,a crop that has required intensive cultivation the preceeding year is of importance.A good plan to follow would beTo preceedsthe planting of the strawberry two years,have a heavy clover sod.This can be turned under in the fall and a large amount of plant food will thus be added to the soil,and in addition a quanity of humus.This will maintain the moisture content to a great extent in case of drought.In the spring preceeding the planting o f the strawberry grow any crop,such as corn, potatoes or cowpeas that require long and intensive cultivation.Cowpeas is probably one of the best crops to grow.They should be planted in drills about two feet apart,to allow thorough and intensive cultivation.In the fall the crop is turned ,and in this manner more plant food and humus is added to the soil.

In many cases where it is impossible to have either a clover sod or a cover crop the yaar previous to planting,a heavy application of manure is of advantage.It is best to apply the manure in the fall,and then plow under.During the

winter it will start to break down and decompose,and before the planting occurs in the spring,large amounts of humus will be added to the soil.It is almost impossible to place too much manure upon the land and a good application is between thirty and forty tons to the acre..Many growers prefer to spread the manure in the spring after plowing,and then thoroughly disc. The advocates of this method base their claims on the fact that the roots of the strawberry do not extend their roots very far into the soil.This would result in the plant being unable to take up the plant food from the manure that is turned under in the fall.

PLOWING and PREPARING the SOIL

Plowing can be done in either the fallor in thespring,and the grower must adapt himself to those conditions that best befit his soil.Unless the land be very heavy,so that there is danger of puddling in the winter,fallplowing should be practiced.When the plowing is not done in the fall,it should be started as early as possible in the spring,and then rolled so as to not stop the upward capillary movement of the water.

It is important that the soil be plowed as deeply as possible,as a reservoir is then formed,,which holds the water to a great extent that falls during the winter andspring months.With a deep soil it is possible to turn the furrowto a depth of seven or eight inches.The lighter and shallow soils should be plowed but little deeper than the topsoil.Some growers advocate the use of the subsoil plow.With this tool the subsoil can be stirred to any depth,without bring it to the surface.

In the spring and as soon as the soil is dry enough to

work the harrowing is started.The common disk harrow is best for this purpose,and by running it across the plowed surface and half lapping each time,the soil is prepared for the spike tooth harrow.

The spike tooth harrow is very important,it has a tendency to keep the surface level,and also makes the earth much finer and in a better condition for growth..

Many of the growers roll the soil after it has been harrowed,and the advantages derived are,Increased capillary action and a more even and level surface,This akes it easier to mark out the rows for planting.The method practiced is to use a large wooden roller,which does not pack the soil too tightly. In case of the lighter soils,a heavier roller can be used.In all cases and as soon as the plants have been set,a soil mulch should be given or a large amount of water will be lost.

FERTILIZERS.

Strawberries are rank growers and require a large amount of plant foodBulletin No.62 from Central Experimental Farm of Ottawa Camada in speaking of fertilizers says;"

"The best fertilizers for strawberries is well rotted barn yard manure,which should be used in large quanities.There need be little fear of using too much----thirty tons of well rotted barnyard manure beigg a fair application.It may be applied early in the spring before planting and thoroughly incorporated in the soil or it may be used for a previous cultivated crop so as to get the soil clean and in the best condition for the strawberry plants.Fresh manure is not as satisfactory as rotted,for it may make the soil too loose,causing it to dry out quicker and making the conditions bad for newly

set plants.On heavy soils freeh manure may be used with better results than on lighter soils,but as there are likely to be many weeds grow if green manure is used,rotted manure is p preferable even on the heavier soils.If fresh manure is used it will be better,mixed with the soil at planting time,if it is applied in the previous autumn.Wood ashes are very useful for a top dressing,and from fifty to one hundred bushels may be applied broadcasted early in the spring when the land is being harrowed,the larger quanity being used for land that is poor in potash.An application of even twenty five bushels per acre should give benefial results.If barnyard manure cannot be easily obtained,nitrogen and humus may be added to the soil by plowing under clover,peas or some other leguminous crop;potash by using from two to three hundred pounds per acre of muriate of potash,if wood ashes cannot be obtained;phosphoric acid by the use of ground bone,at the rate of two to three hundred pounds per acre before planting.Nitrate of soda is also used for furnishing nitrogen unless it can be obtained in a cheaper form,by the use of barnyard manure or of leguminous crops.An application of one hundred to one hundredfifty pounds nitrate of soda broadcasted just before t the flowers open in the spring, is desirable if the plants are not making vigorous growth."

The condition of the land as regards fertility,must be taken into consideration.If a fair crop of potatoes ,cowpeas etc. has been produced the previous year,it will no doubt pay to add some commercial fertilizer.However it would not be practical to plant a strawberry bed on land that has had application of commercial fertilizer alone

for three or four years predeeding.This soil would lack sufficient humus and thephysical condition would be poor. Wilkinson suggest the following for a soil that is lacking in plant food;

I50 lbs.Nitrate of Soda.	Nitrogen 2.9 %
600 lbs of Tankage.	
800 lbs.acid Phosphate	Phosphoric acid.9.4 %

"Follow this with an application of a mixture stromg in nitrogen and phosphoric acid,at the rate of three to five hundred pounds pw acre,applied along the row during the latter part of June or the first part of July.The application should be made only in case the runnmss are few or lacking in size."

H.W.Chandler while located at the Missouri station,ran a series of test for a period of three years with commercial fertilizers.While results obtained Mis.cannot be expected to check with New York and other localities,in which conditions are radically different,the general conclusions drawn,might well be applied to the question of commercial fertilizers.The summary of Mis.Bull.No II3."CommercialFertilizers for Strawberries"follows.

Acid phosphate used alone at the rate of from I50 to 440 pounds to the acre has,in five trial soils out of six givem a profitable increase in the crop.The one soil in which it wa s not protitably applied,was a much richer one than is usually used for strawberries.

In six trials out of seven,acid phosphate used incombination with either sodium nitrate or dried blood has increased the yield over that obtained when these latter substances

were used alone.In one case where it did not increase the yield,the fertilizer was applied in the spring,and the nitrogen caused an exceedingly rank plant and weed growth so that little could be told, as to the effects of the phosphorous.

Acid phosphate used in combination with sodium nitrate or dried blood has increased the yield over plots receiving no fertilizer,in only two cases out of eight.

Acid phosphate used in any practical quanities, has no injurious effect on the plants,even when it is spread on the foliage.

Potassium has in no case shown conclusively any increase in the yield of strawberries,neither has it affected the color or the quality of the fruit.Like sodium nitrate it is injurious when applied in small quanities or near the plants in the soil,in large quanities.

Nitrogen in the form of either sodium nitrate or dried blood,when applied in the spring before the crop is harvested has in every case given injurious results.It causes excessive plant and weed growth,and greatly reduces the yield of the fruit.While the berries are larger there are fewer of them and they are soft and have poorer color and quality. when the season is dry at picking time,the berries on plots fertilized with either sodium nitrate or dried blood,wilt much worse than do those on unfertilized plots.

Nitrogen in either the form of sodium nitrate or dried blood applied a year before the crop is harvested has given an increased yield over unfertilized plots,in only one trial out of nine.

Where sodium nitrate or dried blood are applied in small quanities duringearly summer one year before the crop is harvested,they do not cause excessive plant or weed growth the following spring.However when dried blood is applied,at 300 or 400 hundred pounds to the acre,even a year before the crop is harvested,it tends to cause excessive plant growth,to reduce the yield and to cause the berries to wilt worse during drouths at picking time.

The use of stable manure on the field at any time after the plants are set seem to have the same injurious effect,the stable manure used on another crop a year or two before the land is set t o berries seems to benefit the strawberries in some cases at least.

Sodium nitrate spread,even in small quanities near the plant,will kill it.Dried blood does not have this harmful effect."

PLANTING.

There are two seasons for planting the strawberry;spring and fall.The rain fall governs the planting to a great extent, and if the rainy season is in the spring,like in the northern states,plant then;if it occurs in August or Sept. the plants should be set at that time.If there is not plenty of moisture at the time of setting,many of the plants will not live and the stand will be very uneven.In the southern states,such as Florida and Georgia,the fall planting is practiced,as here a long growing season may be expected and a profitable crop will be returned the following spring.In the northern states however a grower cannot expect to harvest a paying crop the spring following fall planting,and planting at this time

incurs the extra expense of the mulch and the labor involved therein.As a result the most successful planting in the North is done in the spring;at this time the soil is cool and damp and the plants make a vigorous and hearty growth,and many runners are produced during the summer and fall,thus insuring a full crop the following season.

There are many different systems for marking out the strawberry bed,and the method used is largely one of personal preference.It is of importance that the plants be set in straight rows so as to facilitate cultivation.Many growers use a line to insure a straight row;others use a marker,which will set off several rows at one time,and then these rows are cross markedto show the distance apart the plants should be set in the rows.

One of the most common methods is that of marking out with the common calf tongue plow,by simply running a single furrow several inches in depth and of any desired length.This system is the quickest and the cheapest,but the rows are irregular and the furrows cannot be maintained to a constant depth.While either one of the other methodsis more expensive the results obtained are more gratifying and will be cheaper in the end.

In setting the plants,a spade,dibble or trowel can be used,but the common garden spade will give the best results. two men are required to do the work;one opens up the ground to receive the plants and the other does the planting.It is advisable to keep the roots of the plants immersed in a bucket of waterwhile carrying around the field,prior to planting.

The man with the spade makes an opening six to eight inches in depth at the required place of planting,and the handle of the spade is pressed forward,thus leaving an opening in the soil in which the other man places the plant,care being taken to spread the roots as much as possible.The spade is now withdrawn and the soil is pressed firmly around the plant with either the foot or the hands.It should be packed firm enough that the plant cannot be pulled out easily with the hands. Prior to poanting however the roots should be pruned,cutting off about one third of the growth.The leaves should also be pinched,and only the last one produced by the plant should be left on.With this pruning,the plant will startaan easy and rapid growth and new roots and leaves will soon appear.

It is important that the plants be placed at the correct depth in the soil,otherwise there will be considerable danger of loss.Care should be taken to have the crown of the plant,w which is that portion where the roots and leaves start,just a little above the surface of the soil,after it has been planted.If the crown is too high above the surface of the ground it will dry out and often times die.On the other hand if planted too deep and the crown is covered with dirt,it will become smother and die,or at least the growth will be greatly retarded.

Thereare four principal methods of planting,and the description and advantage of each,follow by Wilkinson;

Matted Row.

"The most common system of strawberry growing thruout the United States is hhe matted row system.This is most popular where the berries are sent to the cannieries,on large

commercial plantations,and where farm labor is scarce and not reliable.The reason for this is because there is less labor required in the setting out and caring for the plants,and the crop of fruit is larger"

After the plants are set in rows,which are three tothree and one half feet apart,with the plants eighteen to thirty inches apart in the row,the runners are allowed to have full swing and they develop as many plants as they will."

In cultivating,the machine is only run in one direction and as the plants spread the cultivated space narrows until twelve or fifteen inches at its greatest width.

The greatest drawback to this system,is that many great plant producing strawberries are allowed to set their plants too close together,resulting in a some what smaller crop and quite small fruit,which of course will not bring the highest price in the market,and also costing more in time and money to pick.Careful attention to the thinning of the plants in too haavily set rows will obviate this drawback.

Single Hedge Row.

This system is quite well adapted to a more intensive system of strawberry growing.The main idea is to set out the plants in rows 2 to 3 feet apart,the plants being 20 to 30 in. apart in the row.Each plant is allowed to produce two runners, and one plant is produced one each runner.Other runners are clipped off as soon as they are produced,

These two new plants are trained to grow in the row of older plants,each plant being one foot distantfrom 9its

neighbor in the row,and allowing no runners to grow.

The great advantagesof this system are;larger developed plants,tending to larger fruit,ease of cultovation but more expensive,owing to the fact that runners must be cut out during the growing season."

Double Hedge Row.

A system which is a development of the single hedge row idea,in which the mother plant is allowed to set either,4,6 or 8 plants ihstead of two.These planta are trained to form three rows,one bein in line with theolder plants and a row on each side of the mother plant row,each plant havi g a certain alloted space,which permits ease in hoeing and cultivation,also eliminated crowding,permitting plenty of sun light and air to reach each plant and giving a heavier crop of large berries than in the single hedge row".

The plants are set 30 inches apart in the row,the rows three feet apart,allowing when the plants are grown,about one-half the space for growing and one half for clean culture."

Hill System.

"The most intensive system of strawberry growing,in which the plants are set fron one foot apart wach way,to one foot apart,in the rows and eighteen to thirty inches apart,the plan being to not allow any new plants or new runners to set, but permitting the plants to grow to great size,believing that more and larger fruit of better quality will result.

This system being so very intense requires heavy manuring and fertilizing as well as constant cultivation and attention to runner cutting.The plants are very large,are well supplied

with blossoms in the fruiting season,and are loaded with large fruit later".

Cultivation.

The roots of the strawberry are quite short and not very numerous,and as a result the plant is known as a shallow feeder. At the same time it is a very rapid grower and consumes a large amount of water,in absorbing the plant food from the soil.This moisture is taken into the plant by way of the roots and is then passed off thru the leaves.It is therefore obvious that the conservation of the moisture is essential,and cultivation with this object in view should be practiced.Intensive cultivation is essential and should be practiced as soon a s the plants are set out in the spring,and continued during the entire growing season.During the early season and before the roots have grown to any extent,the cultivation should be quite deep.After a few weeks however the roots will have extended nearly the entire distance between the rows.If deep cultivation is continued the roots will become injured,and the growth of the plant retarded.

After the first month,two inches is deep enough to cultivate,and at this depth the soil can be kept loose and friable. Soil in this condition allows the air to penetrate the earth which is of great importance,as the roots need air;it retains the moisture in the soil by means of the dust mulch which is formed,and thus prevents rapid evaporation from the surface;it helps to break down plant food which would otherwise remain insoluble and also keeps the soil free from the weeds,which would rob the plant from some of its moisture.

As regards the impliments to use in cultivation, there are many and the opinions of different growers vary. In the early spring, cultivators with quite wide shovels may be used, After the soil becomes dry and shallow cultivation is desired, only impliments with very narrow teeth should be considered.

For the commercial grower, the one horse eleven tooth cultivator is the best. The teeth are small and the depth and the width of the area can be regulated by means of levers. The tool leaves the soil level and fine and loosems it very close to the plant.

Some growers use weeders for cultivators, as they cover a large amount of territory, and leave the land in a good condition. In using the weeder however, care should be exercised in not loosening the soil about the plant.

For the hill system of planting or where the beds are small, the Planet Jr. of the Columbia cultivator can be used. The man power wheel hoe cultivator can also be used with very good results.

It will be necessary to use the common hand cultivator to some extent as it is impossible to get close enough to the plant, with any of the machine cultivators. The tool can also be used for cutting out any of the surplus runners that are not desired.

As to the amount of cultivation and the number of times to cultivate per season, it would seem that the more often the cultivation took place the better off the plants would be. It is impossible to cultivate too much, and the work should be done immediately after every rain, and every ten days to two weeks during the entire growing season if possible.

The patch should be gone over every few days,and all surplus runners removed.The less growth the unnecessaty runners are allowed to make,the less water and plant food will be taken from the parent plant,thus giving the later more chance to develop and bear fruit the following season.

During the first season of growth,after planting,the plants should not be allowed to blossom or bear fruit as "Fruitage lessens plant growth".Therfore remove the blossom clusters as soon as they appear,sp as to strengthen the parent plant.

The Mulch.

In the fall,after cultivation has ceased,and all growth of the plant has ended,a mulch should be placed over the plants. there are a great many different kinds of material used,and the grower may best adapt himself to those that best suit his locality.Natures mulch is composed mostly of leaves and grass.In using leaves care must be taken,as they pack down too tightly, and a light covering of straw should be used with them,to cover the plants and to hold them in place.Any of the grain straws, such as,wheat,oats,barley or rye may be used,Marsh grass is another excellent mulch,and in certain localities,seaweed and pine needles are often utilized.Light straw manure may be used if plentiful and not too expensive,but care must be exercised that it does not cause heating of the plants.

The objects of mulching,as discussed by A.E.Wilkinson follow:

(I)"Protection of plants from winter or early spring injury."The excessive cold on the bare ground often results in the death of the plants.Heaving of the plants in the early

spring,caused by frost is one of the greatest sources of unthrifty,profitless strawberry beds.These can both be overcome by mulching with the proper materilas.

(2)Conservation of the moisture on the soil by hindering evaporation.From a study of soil cultivation it is found that by breaking up the top layer and leaving it in a fairly loose condition,it is possible to reduce to a minimum the loss of moisture by evaporation.This is nothing more than a dirt mulch and stops capillarity,the rise of water in the soil just below the loosened surface.Any material such has been mentioned will give the same results as the dirt mulch and has the further advantage of being more permanent,not being destroyed ,as in the dirt mulch by the first rain.

(3) Retaining the surface soil in a loose and friable condition.This is brot about by the fact that the soil is not packed down by being tramped upon,or by heavy rains beating upon it,but is retained in the same conditions it was just previous to being covered with the mulch material"

(4)In some cases plant food is added to the soil.This is particularlyIso when material is used as a mulch,principally by the washing of the plant food out of the manure into the soil.

(5)Cooler soil,the direct results of the shading of the soil and the liberal supply of moisture in the top-soil,making root growth;in colder regions,retarding growth until all danger of frost is past.

(6) Lessens weed growth by smothering young seedlings."

(7)Where some of the mulch is left on the bed after plant growth starts in the spring,it holds the fruit up from the

soil,there by enabling the grower to obtain cleaner fruit".

The mulch is best applied by means of the manure spreader which should be set to throw out aoout I5 tons to the acre. This will cover the plants in an even manner and to the correct depth.Too thick a covering is not desirable,as it often times causes the plant to heat and id a great deal more expensive. A two inch mulch will give much better than one four or five inches in depth.

In the spring the mulch should be removed,about the first to the middle of April or before the plants have started to grow.If growth has started under the mulch,it will be ofa whitish and tender character and will be more susceptible to climatic changed.In removing place it between the rows and work it down among the plants in the rows.When treated in this manner, a cushion is formed which keeps the berries from becoming dirty and gritty,when rain falls during the period of fruiting.

Harvesting.

The commercial grower should be located close to the city or town,where plenty of help can readilly be secured;The strawberry is a short seasoned fruit,and it is necessary to have plenty of help,and exactly when needed to harvest it.

Women as a general rule are the best pickers,as their fingers are more nimble,and then they are more careful and do not tramp down the vines to such an extent as dothe men.No fr fruit requires greater care in the handling than the strawberry,and the fields should be picked every day.This prevents any over ripe fruit from being left on the vines and thus getting into the boxes later.

Where the field is large and a great force of pickers must be employed,it is well to hire a foreman.This man assigns the pickers certain rows and then passes up and down the patch inspecting the fruit as it is picked,and seeing that the patch id left clean,with no over ripe fruit remaining on the vines.

Each picker should be given a tray,holding six.eight or twelve quart boxes into which the berries are picked directly. In case the fruit is to be graded,it can be sorted while picking and thus a second handling is eliminated.In picking,the berry should be grasped by the stem,pinching off from one half to one fourth of an inch from the fruit,which is placed in the box with as little handling as possible.If the berry is seized in the fingers and pulled off,it becomes bruised and soft and becomes unfit for even home use..

Berries for a distant market,should be picked as soon as they are colored all overbut before they begin to soften. Some varieties will color up while enroute to market and these are quite important commercially.In case the market is of a local mature,the fruit may be picked when riper and of a richer color,thus insuring a better price.

The pickers are usually paid by the quart,and the prices vary from one to two cents.There are certain systems for keeping accounts with the picker;one is to check off on a printed sheet as the fruit is brot into the packing shed.The check system is probably the best.In return for a certain number of boxes of fruit,the picker is given a punched check,denoting the fruit picked;the owner also has a duplicate check and at the end of the week or of the season the checks are turned in and cashed.

There are several rules,regarding the picking of the strawberry which follow;

1-The fruit should be picked when dry and the morning dew is gone.If picked while damp,the fruit becomes soft and mushy,and will soon spoil.

2-The berries should be pikk all over,and not on the upper surface alone,as this will result in a very uneven appearance on the market,and inferior prices will be obtaines.

3-The fruit should be picked riper in cool than in warm weather.

4-Local markets require the picking of riper fruit than do the more distant markets.

5-After the fruit has been picked,it should be kept in a cool place and always away from the rays of the sun.

6-Market berries require stems from one foutth to one half inch in length.

Thereare many growers who can successfully produce a large crop of strawberries,but thru their inability to market the fruit ,poor prices arecobtained and they declare that there is no money in the business.The price of the fruit depends upon the conditions,and the producer who can place his berries on the market in a clean,net and attractive manner,will bw able to command betterprices than his competitor who is less careful.

After the fruit has been taken to the packing shed,it is allowed to cool and thensorted and packed.All of the imperfect berries in sight are removed,and the fruit on top is arrainged in a neat and attractive manner.The box should be well filled for several reasons.If this is not donethe fruit will

often be crushed or if the box is not filled the fruit will often shake out.Also in transportation the fruit will settle to a certain extent and the box should be well filled ere starting to marketas a basket of fruit only partially filled will not present as good an appearanfe on the market,even tho the fruit is of excellent quality.

A great deal of the profits of strawberry growing depends on the market.A good local market is to be desired as the fruit can be handled riper and the grower has a better opportunity tocome acquainted with his patrons and rhus establish a reputation.

In the larger cities,the public market can be utilized and in this manner the middle man is eliminated and the product is sold direct.

In the more distant markets the fruit is usually shipped to the commision man who sells the produce and then the profits are shared in the form of a percentage.

The establishment of the fruit growers associationd,in nearly all large comme cial centers has greatly lightened the cares of the producer.It has enabled them to secure better transportaion,better service from the commision man and also better markets.By pooling their interest and all shipping together,they are able to send larger quanities and thus cheaper rates are to be obtained.

The associations also furnish supplies at whole sale prices and in any quanity desired .There are several different kinds of boxes and crates,and each market has its own particular fancy,and it is well for the association to deal with this factor.The most important of the basjets and crates are the

Leslie.which is the standarsd box of the South.The Berlin and Hallock are used mostly on the North,and are to be found in any of the markets. Some states have laws pretaining to the size of the box in which the berry is placed.It is well for the producer to understand this law.A crate in which to hold the differentboxes is necessary.They come in three sizes.The Berlin and the Leslie hold twenty four and thirty two quarts respectively,while the Hallock holds either sixteen or twenty four quarts each.

The boxes and crates are usually made of bass wood and are shipped in the flat.During the winter and when time is not sovaluable,they aremade up and are thus ready when the season opems in the spring.

Treatment after Harvesting.

The most satisfactory and dependable results are to be obtained when only one crop of fruit is to be harvested from the bed.A bed set out one spring should be plowed up and destroyed after the fruit has been gathered the next year.This results in a new bed being set out each year,but it insures one from less danger of disease and weed trouble and a surer crop of fruit each season.

There are however quite a number of growers who are advocating the renoviation of the old bed,believing that a patch can produce two and even three crops of fruit.In this practice the idea is to get the old bed,back under similiar conditions to that under which it was first planted.

mAfter fruiting time,the patch is mowed off,and then allowed to dry for a day or so.In mowing,care must be taken that the

crown of the plant is not injured or death will ensue.After drying the plants and mulch are raked into rows and burned. Some growers advocate the burning directly over the fruiting area,but in doing this there is danger of injuring the plants and it is best to take away from the bed before burning.

There are several methods by which the plantation may be renewed,but the one requirment in all cases is to have the bed filled with hearty and vigorous growing plants.

The first method consist in narrowing down the width of the bed to eight or twelve inches,by plowing one or more furrows away from each side of the bed.The plowed surface is then covered with manure at the rate of I5 to 20 tons per acre and then cultivated.The five or seventooth cultivator should be used;it thoriughly mixest the manure with the soil and levels the surface between the rows.Prior to cultivating it is best to go down the row with a hoe and cut out all old plants.Better than this hoe out six or eight inches of soil and then leave six or eight inches,with three or four vig erous growing plants.In this manner the plants will send out new runners and good results are obtained.

Another method to follow,is to plow and turn the furrows from the aisles over upon the rows.The land is then manuredand the field is harrowed both cross and length ways untill the plants are uncovered and the field is level.

Other growers only plow on one side of the row,thus turning under all parent stock,and leaving a row of nothing but young plants and only eight to twelve inches in width. Here also manure is applied and then the field is worked to a level.This method gives the majority of the plants new ground

in which to grow,as the center oftheebed is moved at least one foot from its former position.

Generally speaking,it is not best to follow strawberries with strawberries in the same spot until the soil has been rested or rotated for several seasons with other growing crops. There are several disadvantages resulting in the renovation of the old bed,among which are the following.

I- More danger of strawberry fungi and insects,as the old bed is prolific breeding places for such.

2-Old beds result in smaller fruit.

3-The soil is not in as good a chemical of physical condition as that of the new bed.

4-Weeds are more bountiful in the old bed,even under the best of conditions.

5-The cost of cleaning and cultivating the old bed is greater than that of setting out a new bed.

Insects and Diseases.

There are a good many insects and diseases affecting the strawberry.Until a few years ago,spraying was not essential, but since the fruit has grown in popular favor,and the acerage and the number of varieties has increased to such an extent. the number of deseases has increased to such an extent,that it is now necessary to combat these in order to grow a successful crop.

The following insect pest and diseases with habits and treatment are quoted from different authorities.

Insects.

From"Modern Strawberry Growing."

Root Eaters--There are at least three species of beetle which in the larval or grub stage livein the ground and feed upon the fibrous roots of the strawberry plants.As their life history and description are so nearly alike,they can all be called white grubs or Juhe bug larvae.These grubs are so common throughout the United States,that they need no introduction.They are particularly abundant in grass lands,both meadows and pastures,owing to the fact that their principal food,is the roots of grass,weeds and herbs.These insects destroy practically ever strawberry plant almost as soon as it is set, if sod ground is used for growing strawberries.

When the grubs have become full grown,they have a rest period,or pupal stage in which they encase themselves in earthen cells in the soil.After a certain lapse of time they come out as small beetles and feed upon the foliage of the plants, sometimes doing considerable damage.

The remedy for the insects in the larval stage is to fall plow sod land,following this with one or more years of crops that require good tillage.In the case of the strawberry beds being infested,it would be very difficult to deal with the grubs on accout of their underground habits.If badly affected it would be better to plow up.Breeding grounds,such as old strawberry beds,should not be allowed to remain.

Crown Eaters--Several different insects attack the crown of the strawberry,the crown miner being one of the important ones.This is a small,reddish caterpillar that constructs or b

or bores irregular passages thru the crowns of the plants.No successful remedy has thus far been brot forth.Fiels badly infested should be plowed up.

Central Exp.Farms.Ottawa Canada.Bull.No.62.

Leaf Roller.--The caterpillars of this insect fold the leaves of the strawberry by drawing the upper surfaces together and fastening them with strands of silk.They then eat away all the greeninner surface of the leaves,giving the beds a brown and seared appearance.The first brood of caterpillars is found during the month of Jube,when most of the injury is done.There is a second brood in the autumn.The caterpillars when full grown are about one third of an inch long and vary in color fron yellowish brown to dark brown or green.The first brood turns into chrysalids in late June or in early Kuly and soon hatches into moths which lay their eggs for the second brood in la te July.The larvae of the second brood hatch and attack the strawberries in late summer and in early autumn. By the end of September,the insect is again in the chrysalids stage in which it passes the winter.

Remedy.--Spray with Paris Green4 ozs. to 40 gallon of water or with arsenate of lead 3 pounds to 40 gallon of water, before the leaves become folded.Several applicationa are necessary,as new leaves are apperaing all of the time and the hatching season of the eggs extends over a considerable period.Spraying should not be done while the plants are in full bloom,nor after the fruit has formed.If a bed becomes infested, the foliage should be burned,or raked off and burned immediately after the crop is harvested.

Strawberry Weevil.-- The strawberry weevil frequently does much harm by cutting off the flower buds, the stem being severed close to the head. The grub of this insect feeds on the pollen of the flowers and after a female has laid an egg in t the bud she cuts the latter of so that it may not develop. The unopened bud falls to the ground and the grub of the weevil developes inside of it. There is only one brood of this insect in the year. The beetles appear in August and then hide away beneath moss or among bushes and remain in a lethargic condition until the following spring. The varieties of strawberries choosen by the female for egg laying are those which produce much pollen, as it is chiefly upon that part of the flower that the grubs feed. Varieties of strawberries which are bearers of pistillate flowers only, are not attacked, consequently when the weevil is abundant, growers will do well to plant a large propottion of pistillate sorts only, using enough plants of the perfect flowering sorts as will ensure the proper fertilization of the fruit.

As the strawberry weevil passes the winter in the mature beetle form, and flies to the strawberry buds just before the flowers unfold, when the work of the weevil is noticed in the spring, it would be well, where it is practicable, to cover the rows of the perfect flowering plants with chees cloth until the flowers are well opened. Trapping the beetles it is claime d has produced good results. For this purpose pollen bearing plants should be planted in rows near the bearing beds, snd when these are found to be covered with the beetles, the plants may be sprayed with whale oil soap solution, one pound in five gallons of water, or with kerosene emulsion.

Cut Worms--Cut worms some times do much injury in the strawberry plantation,especially th climbingg species.they do their destructive work at night and tho the injury to the roots or leaves is apparent in the mornig,the cut worms have dissapeared.They may uwually be found secreted in the surface soil not far away from the plants they have injured.

Remedy--Where either the climbing or the non-climbing species is troublesome,or where injury is done to either leaves or roots,the most effective remedy is poisoning with a mixture of bran and Paris Green,in the proportion of of one half pound of Paris Green to fifty pounds of bran.The bran is slightly moistened before the Paris Green is added,so that the latter will mix better with it.This moistened bran of which the cut worms are very found,is scattered on the surface of the ground about the plants.

Diseases.

" Modern Strawberry Growing." Wilkinson.

Fungous diseases.--The most important fungous is the leaf spot.This makes its appearance in the form of small,discolored spots,being the most abundant about the time of flowering.At first these spots are of a reddish or purplish tint, a little later increasing in size,resulting in the death of the tissue and a change in color to white in the center bordered by red or purple at the edges of the spots.Practiaally all strawberries are susceptible to this disease,tho some varieties are more resistant than others,especially Marshall and Brandywine,while Beederwood has great susceptibility.

The remedy is bordeaux mixture sprayed on just before the flowers open,followed(if the disease is seriously prevalent)

by mowing off and burning the leaves after the fruitingsea-son is over.On small beds the diseased leaves may be removed by hand.

These remedial measures will also control the other less important ones,which need not be discussed in detail.

Economic Importance.

The strawberry is one of the newest fruits in this country,and the first commercial variety was only produced in I834 by a Mr.Hovey of Boston Mass.Since then however,and caused by the fact that it is such a cosmopolitan fruit,it has grown by leaps and bounds.

The last census shows thatthe relative tank and the number of quarts produced of each of the five leading small fruits was as follows;

Strawberries.----------	255,702,000	Quarts.
Raspberries----------	60,918,000	"
Black berries----------	55,343,000	"
Currants----------	I0,448,000	"
Gooseberries----------	5,282,000	"

Here it is seen that the strawberry leads with a production of more than four times that of the raspberry,which is second on the list.

Of the strawberry alone,the leading acerage in I909 was Maryland;Tenn;Miss;New Jersey and Mighigan,but as to production it was found to be as follows

Maryland--23,6II,000 qts.

New Jersey-I8,767,000 "

New York--I5,964,000 "
California-I5,694,000 "
Missouri--I5,I7I,000 "

These five states produced89,089,000 quarts or about one-third of the total yoeld of the United States,which was 255,7 255,702,000 quarts.

New York led in the value of the fruit produced and was followed by Califorhia,Missouri,Maryland and Michigan, with no other states producing as much as $I,000,000,worth in I909.

The number of farms reporting strawberries,showed the four leading states to beas follows;

Iowa----------I9,87I

Michigan----------I6,798

New York----------I4,086

Pennsylvania--------I3,5I5.

The above figures show that the strawberry is indeed a cosmopolitan fruit and that its popularity is great,Being the first fruit to ripen in the spring,it is a most welcome visitor,coming when fresh fruit is in grat demand. There is no fruit that produces as quickly after fruiting,and a s Harriet said,"The family is entitled to a daily feast of strawberries in season".

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